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VOLUME 8 OCTOBER, 1928 NUMBER 4

INTRINSIC CANCER OF THE LARYNX OPERATED ON BY LARYNGOFISSURE

IMMEDIATE AND ULTIMATE RESULTS *

SIR ST. CLAIR THOMSON, M.D.
LONDON, ENGLAND

This paper includes a report of every patient with intrinsic cancer whom I have treated by laryngofissure; the after-history has, fortunately, been available in every instance, and nothing has been extenuated or set down in malice prepense. This record is the result of more than twenty-eight years' experience in carrying on the pioneer work of Butlin and Semon.[1] It embraces my earliest efforts as well as the results of more mature knowledge and technic. It therefore, I hope, carries the lessons both of early anxieties and of increased experience. It is the largest personal record which has, so far as I know, been contributed to the subject. Although none of us is free from bias, I venture to claim that the work is sincere.

LARYNGOFISSURE: A DEFINITION

Laryngofissure is an inadequate expression to describe the operation I practice. The term fissure of the larynx, or splitting the thyroid cartilage, or thyrotomy, should be employed only to indicate the route of approach. I also employ this route for a simple exploratory examination of the larynx. One might continue with the term "laryngofissure" in this sense; but students will start with mistaken ideas if they think that it still means simply "splitting the thyroid cartilage and taking out a vocal cord." The operation I practice means excising a mass which contains in its center the whole cord, and includes the anterior commissure in front, part of the arytenoid behind, the ventricular band above, and the subglottic area below. This excision goes deeply enough to include the perichondrium lining the thyroid cartilage and, occasionally, that on the inner side of the cricoid ring. As the greater part of one thyroid ala is also excised (to obtain freer access and secure better healing), it will be

* Read, by invitation, before the American Laryngological Association at its semi-centennial meeting in Washington, May 1, 1928.

* This paper was also submitted for publication in the *British Medical Journal.*

1. "For the cases recognized early and promptly operated upon by those best qualified to do so, the methods taught by Mr. Butlin have yielded results which may well be ranked among the chiefest triumphs of modern surgery" (Delavan, D. Bryson: Am. Laryng. A. Tr. **26**:167, 1904).

seen that a so-called "fissure" really means a partial laryngectomy. Operations for malignant disease should be designed to meet variable conditions, the main object being to obtain a full-face view of the whole extent of the disease so as to remove it, with a satisfactory margin of healthy tissue in all directions, while securing the safety of the patient and avoiding unnecessary mutilation.

CLINICAL MATERIAL

I have operated through a laryngofissure on seventy persons with intrinsic cancer of the larynx.

Proportion of Cases in Men and Women.—Table 1 shows the large preponderance of men and of cases in private practice. Hospital patients are less numerous for the simple reason that the ignorant and unedu-

TABLE 1.—*Patients Operated on by Larygnofissure (1900-1928)*

	Number of Cases	Private Cases	Hospital Cases	Age Limits
Male	63	56	7	40-80
Female	7	4	3	35-58
Total	70	60	10	

TABLE 2.—*Incidence, According to Age and Sex, of Seventy Cases of Intrinsic Cancer of the Larynx*

	Ages						
	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	Over 70	Over 80
Male	0	2	14	28	13	5	1
Female	0	3	2	2	0	0	0
Total (both sexes)	0	5	16	30	13	5	1

cated do not present themselves early for what they regard as a trifling huskiness, or, if they do, will not accept advice until the lesion has so far advanced that complete laryngectomy is the only possibility.

Age Distribution.—Table 2 shows the incidence of my seventy cases according to sex and decade.

Here it is noticed that cancer of the larynx is not unknown between 30 and 40 years of age (of course, cases at much earlier ages have been recorded); that, in men, it may occur in advanced life; and that it appears to be most frequent with them in the sixth decade of life. With regard to the seven women in my list the numbers are, perhaps, too small to justify many conclusions; but it is at least noteworthy that, with them, cancer would appear to be encountered earlier in life and to be rarer after 60. All these women were nonsmokers and abstainers.

Early Experiences.—All these seventy patients were operated on through a laryngofissure. The first case occurred twenty-eight years ago, in 1900, when I followed the technic I had learned at first hand from Butlin and Semon. It included the injection of morphine hydrochloride,

the insertion of Hahn's tube, the curetting of the wound after piecemeal removal of visible diseased tissue, the abandonment of the tracheotomy tube at the conclusion of the operation, and the return of the patient to bed "with the head on a low pillow." As always happens when looking back on the road of surgical progress, one wonders at so many successes.

RESULTS

Patients Alive and Free from Disease.—My results are displayed in tables 3, 4, 5 and 6. Table 3 shows that of thirty-four patients alive today, thirty-two have survived periods varying from three to nineteen years from the date of operation.

TABLE 3.—*Thirty-Four Patients with Intrinsic Cancer of the Larynx Alive and Well, Without Recurrence, After Laryngofissure* *

Case	Age at Operation	Sex	Present Age	Period Since Laryngofissure
6	59	M	78	19 years
11	48¾	M	64¾	16 years
18	65	M	78	13¼ years
21	66½	M	80	12¼ years
22	59	M	72	12¼ years; 11 since gland operation
26	46	F	57½	11½ years since first cord; 4½ since second cord
27	57½	M	69	11½ years
29	47½	M	59	11½ years
31	50	M	61	11 years
32	53	M	64	11 years
33	67	M	78	11 years
36	60	M	70	10 years
38	40	F	50	9¼ years
41	33	F	41½	8½ years since laryngofissure; 7¾ years since partial laryngectomy
42	48	M	56½	8½ years
44	58	M	66	8¼ years
45	35	F	42½	7½ years
47	60	M	67	7 years
50	53	M	59¼	6¼ years
52	40	M	46	6 years
53	58	M	64	6 years
54	58	M	64	5¾ years
55	47	M	55	5¾ years
56	80	M	85½	5½ years
58	79	M	84	5 years
59	52	M	57	5 years
61	49¾	F	55	4⅞ years
62	56	M	61	3¼ years
63	56	M	59½	3¼ years
64	74	M	77	3¼ years
65	54	M	57	3 years
68	62	M	65	3 years
69	59	M	56	4 months
70	62	M	62	2 months

* Two cases are too recent to support any claim for prolonged cure, but their inclusion serves to illustrate other points.

Cases in Women.—In table 3 the vitality of the women may be noted. Five out of seven were alive at periods varying from four and a half to eleven and a half years after operation, although two of them had to be treated for a recurrence. In table 4 it will be seen that the two other women in my series (cases 12 and 35) survived fourteen and a half and nearly four years, to die, without any recurrence, of influenza and cerebral hemorrhage, respectively.

Healthy, Useful, and Prolonged After-History.—Attention might be directed to the advanced age of many of the survivors, to their health and vigor, and to the social well-being secured by having conserved a useful voice. The patient in case 11 is a Canadian, sent to me sixteen years ago by Dr. Birkett, whose diagnosis was confirmed by Dr. Bryson Delavan clinically and by Dr. Jonathan Wright from the biopsy. The patient in case 18 is an active shipbuilder in Scotland. The one in case

21, in his 80th year, writes that he still cycles. Patient 31 is an admiral; he is devoted to social work and can address meetings in the open air. Four are physicians in active practice (cases 52, 59, 63 and 66).[2] Two are lawyers who conduct large affairs (cases 47 and 55). A clergyman is able to preach twice on Sunday (case 44). A schoolmaster retains his post (case 50). A man who was 67 when operated on is now 78 (case 33); three years ago he passed safely through the operation for enlarged prostate; this year he celebrated his golden wedding and made a speech which was audible at a dinner he gave to 120 of his employees. The patient in case 56 is a retired judge who follows the hounds on horseback, five and a half years after his operation and in his 86th year.

TABLE 4.—*Eighteen Deaths from Other Causes, Without Recurrence*

Case	Age at Operation	Age at Death	Period after Operation	Cause of Death when Ascertainable
2	49	50½	1½ years	Laryngitis
3	48	58	10 years	Tubercle
5	54	61	7 years	Unknown (hospital patient, inspected 2 years before death and found sound)
8	58	61½	3½ years	Aneurysm
9	68	74	6 years	Bronchitis
10	55	60-? 63	5-? 8 years	Pneumonia (an Indian subject)
12	53 (F.)	67½	14½ years	Influenza
17	69	75	5¾ years	Cerebral hemorrhage
23	68	7½	8½ years	Urinary toxemia
25	72	84	12 years	Heart failure
28	48	49	11 months	Developed pleuropneumonia with fetid empyema 1 month later. Operation: good recovery*
30	63	65	1¾ years	Angina pectoris
34	75	85½	10½ years	Heart failure
35	58½ (F.)	62	3⅜ years	Cerebral hemorrhage
36a	70	74	4 years	Unknown
37	69¼	78	9 years	Heart failure; arteriosclerosis
40	56	56	50 hours	Operative (hemorrhage, morphine, pneumonia)
51	42	42	4 days	Operative (rupture of esophagus)

* No details obtainable, but Logan Turner did not find signs of recurrence two months before death.

Deaths from Other Causes.—Of the seventy patients, eighteen have died from other causes, without recurrence (table 4). Of these, it will be noticed that thirteen had lived a minimum period of three years without any recurrence, while three of them died ten or more years after operation. (The two "operative deaths" will be considered later.)

Deaths from Malignant Disease Elsewhere, Without Recurrence.—If time permitted, it would be interesting to study in detail the seven cases in table 5 — that of death from carcinoma elsewhere, without local return of the disease. In two of them (15 and 57) the virulence of the cancer must have been intense, for glands in the neck were invaded within four and six months, and the patients were dead within seven and eleven months, although the larynx in each case was free from recurrence.

2. Shown before the Royal Society of Medicine, Nov. 4, 1927, Proc. Roy. Soc. Med., December, 1927, Laryng. Sec., p. 1.

In contrast to these cases are cases 39 and 7, in which the glands did not develop until four and seven years after operation.

In case 1 (the first patient I ever operated on) I watched the larynx remaining free, while a cancerous growth developed on the lingual tonsil on the opposite side.

Case 13 shows how a patient can remain free from disease, in excellent voice and vigor, for eleven years and then die of malignant disease in a region as remote from the larynx as the gallbladder and liver.

Deaths from Local Recurrence.—There were only eleven deaths from local recurrences, all in men. It will be noticed in table 6 that in eight of these the recurrence took place within the first year. This supports Semon's dictum that a recurrence generally takes place within the first twelve months. I myself feel little anxiety if the third month passes without any suspicious symptoms.

TABLE 5.—*Seven Deaths from Later Development of Malignant Disease Elsewhere, the Larynx Remaining Free*

Case	Age at Operation	Time of Onset after Operation	Age at Death	Time Elapsed Since Operation Until Death
1	47	Malignant disease at base of tongue opposite side, started 1½ years after	50	3 years
7	43	Larynx filled up 3 to 7 months after operation. Laryngectomy after 9 months, but no cancer growth found in excised larynx (? syphilis). Diffuse malignant disease in glands of neck 7 years later	51	7½ years
13	58	Death from malignant disease in abdomen, found at operation too extensive for removal	69	11 years
15	52	Infiltration of glands of neck within 4 months	52½	7 months
39	64	Glands in neck	68½	4¼ years
43	54	Mediastinal glands (x-ray observations)	57	3 years
57	39	Glands in neck within 6 months	39½	11 months

These early relapses should not be regarded as a "recurrence of disease." One is more likely to advance the subject if one frankly regards them rather as "incomplete removals," and then investigates why the operation was a failure, or why the case was unsuitable for this type of operation.

The other three regrowths developed three years after the laryngofissure. Case 14 was in an alcoholic subject. The lesion occupied the anterior two thirds of the right cord, invaded the commissure, and descended into the subglottic space. Here I was a little doubtful of having secured sufficient margin, and the pathologist was unable to report a good circumference of healthy tissue. The patient returned to India (and to his alcohol and tobacco), was there inspected and passed from time to time, and returned exactly three years afterward with a recurrence at the anterior extremity of both cords and in the subglottic space below the anterior commissure. At the second laryngofissure, it was seen that the regrowth had originated in this area. His death from heroin

(recorded under "operative deaths") was particularly disappointing, as the pathologist's report encouraged the hope that the second removal had been complete.

Case 19 was one of long-standing hoarseness, in which a large growth was almost entirely located in the subglottic region, and required the exposure of the inner surface of the cricoid. The pathologist reported on the removed mass that "the growth has reached to the line of excision at two margins." Yet three clear and active years passed before there was any suspicion of regrowth. This occurred so stealthily in the subglottic area that, when it declared itself, the disease was too advanced for further operation.

Case 48 was similar, but more promising. The disease left each extremity of the cord free, but descended on the inner surface to below the level of the cord. Excision, to eye and touch, appeared to be satis-

TABLE 6.—*Eleven Deaths from Local Recurrence*

Case	Onset after Fissure	Period Until Death after Fissure
4	8 months	20 months and 12 months after total laryngectomy
11a	? 4 to 6 months	? 9 months
14	3 years	3 years (second laryngofissure; death from idiosyncrasy to heroin)
16	2 months	5 months
19	3 years	4½ years
20	3 months	1 year
24	1 month suspicion, and certain in 4 months; tracheotomy at end of 5 months	15 months
46	2 months (declined laryngectomy)	11 months
48	3¾ years	4¾ years
49	2 months	7 months
67	2 months	4 months

factory, but the pathologist reported "there cannot be much margin of safety posteriorly." The patient was regularly inspected, and remained free for three years, when the disease returned on the same side. Laryngectomy was recommended, but declined; he received treatment with radium elsewhere, and died one and a half years after the return had been diagnosed. He, like the patient in case 14, indulged freely in whisky and tobacco, both before and after laryngofissure.

In all these three cases it was the subglottic situation that thwarted success.

Operative Deaths.—Of the seventy-four laryngofissures performed on seventy patients (two of the seventy having been operated on for a local recurrence and two requiring a supplementary laryngofissure) two have died within forty-eight hours of the operation. The first case, no. 14, has already been referred to in table 6. The patient was successfully operated on in 1913. After three years' absence in India he returned, with a local recurrence; a second laryngofissure was performed without untoward incident in 1916, but he died forty-eight hours later

with drowsiness, contracted pupils and complete suppression of urine. Unusual bleeding did not occur at the operation, but a small hemorrhage took place twenty-four hours after. During my absence he was given half a grain (32 mg.) of heroin, in three doses of one sixth of a grain (11 mg.), within twenty-four hours. One of these doses had not been ordered; yet half a grain was not a large dose. A tracheotomy tube had, fortunately, been left in after operation. Death appeared to be due to an idiosyncrasy for heroin in a very alcoholic subject.

The second patient (case 40) had suffered from syphilis of the larynx for four years before a subglottic intrinsic cancer developed. There was much bleeding at the operation and again within two hours. Through a misunderstanding more morphine was given than was intended—namely, three fourths of a grain (48 mg.)—and he died with symptoms of septic pneumonia within forty-eight hours of operation. A tracheotomy tube had been left *in situ*, on account of the free bleeding at the operation, the subglottic extension of the disease and the syphilitic basis.

A third patient (case 51) died on the fourth day from rupture of the esophagus, due to postanesthetic vomiting.

The last death was a rare accident, not connected directly with the operation. The other two occurred in unpromising subjects, one being certainly syphilitic and both of them alcoholic. Still, I think death would have been avoided if a soporific had not been given. I now refuse to give an opiate of any kind before or after operation, and I forbid all "dopes" before anesthesia (mixed, local and general). If one accepts these three cases as operative deaths, this would give a death rate of 4 per cent—a different figure from that recorded by the pioneers of this subject, and from that still existing in the few statistics which are rarely published.[3]

If permitted to delete case 51 (rupture of the esophagus), I have not had an operative death since that in case 40. This sequence of thirty cases without a disaster encourages me to give it as my opinion that if a laryngofissure is carried out with the precautions and care I insist on, in regard to hemorrhage and the descent of blood into the bronchi, then it should be an operation free from any dangers, except those incidental to all operations.

Lasting Cure.—It is not necessary to revive barren discussions as to how long after operation a patient may be regarded as permanently cured of cancer.

With few exceptions, all patients are in middle or advanced life. To ensure a comfortable and a vocal existence for from ten to twenty years

3. "The results of indiscriminate operation have been so bad that their records are unobtainable because suppressed" (Delavan, D. Bryson: Footnote 1).

to twelve men who have passed their 47th to 67th year (as in the first twelve cases of table 3); to operate on men of 79 and 80 years of age (cases 58 and 56), and to show them healthy and vigorous five years afterward, and to restore doctors, lawyers, clergymen and schoolmasters to their calling, are surely sufficient evidence to claim this method as securing permanent cures.

Dr. Bryson Delevan, when addressing the American Laryngological Association on this same subject twenty-four years ago, said that "statistics based on alleged cures of less than three years' duration are worthless." [4]

The tables I have submitted will show that sixty-three patients are eligible on this basis, and that forty-eight of them were alive and well and free from recurrence at the end of three years.[5] This lasting cure of 76 per cent has been obtained without restricting oneself to particularly promising cases. As the indications for laryngofissure have not yet been established—beyond that of being a suitable operation for many patients with intrinsic cancer—I thought it right to try it in various intralaryngeal manifestations of the disease. Although this may have impaired the statistical results, it has enabled me to form some clear conclusions concerning the indications and limitations of the laryngofissure route for the eradication of intrinsic cancer of the larynx. These will be embodied in a forthcoming publication.

CONCLUSIONS

I trust that the evidence I have submitted justifies the conclusions I have now formulated for some years. This latest and largest record satisfies me that if intrinsic cancer of the larynx is diagnosed early, it is best operated on by laryngofissure—an operation which should be free from danger to life and followed by an adequate voice and a lasting cure. The only necessities for this consummation are early diagnosis and meticulous care in operative precaution and procedure.[6] By educating the

4. Delavan, D. Bryson (footnote 1, p. 155).

5. These figures are arrived at by deducting from my seventy cases the two recent cases (69 and 70), the three in which death occurred from other diseases before the three years were completed (2, 28 and 30), and the two operative deaths (40 and 51). This leaves sixty-three cases on which to formulate results. On the other side of the balance sheet are the thirty-two three-year survivors in table 1; the thirteen who died of other diseases after a lapse of three years (table 4), and the three patients who succumbed to malignant disease in other parts of the body, four and a fourth, seven and a half, and eleven years after laryngofissure (table 5). These, added together, show forty-eight who had passed the three-year limit.

6. Mistakes hardly short of criminal have occurred in laryngeal operations done by inexperienced men working with absolutely no trained helpers" (Delavan, D. Bryson: Footnote 1).

public to pay prompt regard to persistent hoarseness, and by teaching the medical profession to appreciate the niceties and necessities of early diagnosis, the number of laryngofissures and the proportion of lasting cures will steadily increase, while the need for laryngectomy will as progressively diminish.

In other regions of the body there may be better remedies than surgery can supply. In intrinsic cancer of the larynx other simpler and surer remedies no doubt will one day be discovered; but at present there is no better way than surgery and the laryngofissure route. By this, one can secure results which have not been surpassed in the treatment of cancer in any other internal region of the body.

ETHMOIDITIS IN INFANTS AND IN YOUNG CHILDREN

WITH ACCOMPANYING EYE AND ORBITAL COMPLICATIONS *

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This paper is the result of a study of thirty-one cases of ethmoiditis observed during the past few years in private practice and in the Infants' Hospital, St. Margaret's Hospital for Infants and the Child's Hospital, and will deal only with sinusitis in very young patients.

The number of cases is perhaps not large enough from which to draw definite conclusions, but some interesting facts, or, rather, observations, were brought out. The youngest patients were: one, aged 6 months—the youngest patient I have ever seen with definite involvement of the ethmoid bone; one, aged 10 months; one, aged 12 months; one, aged 16 months; one, aged 18 months, and one aged 20 months. All six patients had eye and orbital complications, the three youngest having orbital abscesses with exophthalmos. The other three had severe orbital inflammation, with localized infiltration and swelling in the inner angle of the eye, bulbar chemosis and great edema and inflammation of the lids.

Of the other twenty-five patients, nine were between the ages of 3 and 4 years, and six were between the ages of 5 and 6 years. Of these fifteen, nine, the youngest patients, had ethmoiditis only; the other six had ethmoiditis and maxillary sinusitis.

In the six cases, patients with ethmoiditis and maxillary sinusitis, roentgenograms showed unusually large maxillary sinuses, probably a precocious development, although I have seen antrums large enough for surgical intervention in children between the ages of 3 and 4. These cases are far from common, however. Of the remaining ten patients, four were between the ages of 6 and 8 years, and six were between the ages of 8 and 9 years. These ten had ethmoiditis and maxillary sinusitis. There was not any involvement of the other sinuses in any of the twenty-five patients.

Etiologically, large tonsils, and particularly adenoids, seemed to predispose the older children of this group to attacks of sinusitis, undoubtedly because they were more susceptible to attacks of rhinitis than children without adenoids.

In the 20 months old baby the condition started with bronchopneumonia. During convalescence, abscesses developed in both ears,

* Read before the American Laryngological Association, Washington, D. C., May, 1928.

*. It is well worth noting that Dr. Emil Mayer, in 1902, wrote one of the first, if not the first, paper published in the United States on sinusitis in children.

followed by double mastoiditis. During this time, and before the acute condition in the ears developed, ethmoiditis with severe inflammation of the eye and lids also came on. This case will be reported in detail.

The diagnosis of sinusitis in all cases was based largely on roentgenograms, particularly in the young infants and children, as nasal examinations are not always satisfactory in the very young.

The cases in which there were eye and orbital complications were considered secondary to the ethmoid involvement, even without confirmation by roentgenograms.

Roentgenograms, of which I have taken a large number in infants aged from 6 months up, and in children between the ages of 3 and 6 years, brought out the interesting observation that there is at times a surprising development of the ethmoid cells, particularly in children under the age of 4 years, and in some cases between the ages of 6 and 15 months.

With the exception of the six youngest who had eye and orbital complications, all the patients had enlarged tonsils and adenoids. These were removed as a matter of routine and also to determine the effect on the existing ethmoiditis and maxillary sinusitis.

With the exception of a few cases in which removal of the tonsils and adenoids appeared to be followed by cure of the sinus condition, it could not be determined positively that these operations appreciably modified the existing sinus involvement.

Except in the six cases with eye and orbital complications, operations on the ethmoid were not performed. Orbital complications, particularly orbital abscesses, make radical operation on the ethmoid bone imperative. In such cases the external operation was performed. Considering the fairly large number of reported cases, and probably more unreported ones on record (mostly in adults), of death from meningitis following radical operations on the ethmoid bone, I believe that this operation should not be undertaken in infants and in very young children unless there are severe eye and orbital complications, other systemic complications, particularly arthritis, or heart or kidney conditions.

I have found that in the majority of cases of ethmoiditis in young children conservative nasal treatment directed at good drainage will suffice. The danger of postoperative meningitis is greater in young children than in adults and could easily follow injury to the lamina cribrosa.

Gerber,[1] Boenninghaus [2] and Dreyfuss [3] have collected nearly fifty cases from the literature: the majority were cases of suppurative menin-

1. Gerber: Die Komplikationen der Stirnhöhlenentzündungen, 1909; Meningitis nach Nebenhöhleneiterung, Zentralbl. f. Laryngol., 1916, p. 139.

2. Boenninghaus: Die Operationen an der Nebenhöhlen, etc., 1923.

3. Dreyfuss: Rhonogene Gehirnaffektionen, Internat. Zentralbl. f. Ohrenh., vol. 6, no. 3.

gitis with fatal outcome, and a small number, serous meningitis with recovery.

In the children over 4 years old, when roentgenograms showed definite involvement of the maxillary antrum and one large enough for surgical intervention, the antrum was washed out by puncture through the inferior meatus.

In only one case was an operation through the canine fossa found necessary, and in many cases a single washing out of the antrum sufficed.

In two cases in which multiple arthritis was a complication, the tonsils and adenoids were removed as a preliminary step, and later the antrum of Highmore was washed out. Without doubt, both the diseased tonsils and the maxillary sinusitis were responsible for the arthritis, as the operations were followed by a great improvement of this condition.

In some of the cases, in children between the ages of 5 and 8 years, scarlet fever appeared to be the definite etiologic factor, as the sinusitis, both ethmoid and maxillary, came on during the attacks. The presence of sinusitis was first suggested by the persistent nasal discharge, and the diagnosis was later confirmed by roentgenograms.

In three cases an ethmoiditis and maxillary sinusitis resulted from diphtheria, and in two infection of the sinus occurred during measles. A number of cases could be traced to a mild form of influenza in the Infants' Hospital three years before.

There were also in the Infants' Hospital a good many cases of acute otitis media in a small percentage of which there was complicating mastoiditis, while in many infants there were obscure infections of the eyes apparently following simple colds. In a number of these cases, roentgenograms showed definite involvement of the anterior ethmoid cells in the very young children, and ethmoiditis and maxillary sinusitis in a smaller percentage of the older children. In many of these cases of ethmoiditis followed by acute otitis media and complications of the eyes, it would seem that the old adage "post hoc ergo propter hoc" applies.

The point of view in regard to infections of the accessory nasal sinuses in infants and in young children has changed materially during the past ten or fifteen years. The better understanding of sinus infections in the very young has certainly been helped by the work of Dean, and, anatomically and in a general way, by the investigations of Mosher, Skillern, Coakley, Hajek, Faulkner, White and others.

During this time much has also been learned in regard to the development of the sinuses in infants and in young children.

Dean,[4] in his original and illuminating paper, stated that sinusitis in children 2 years of age or more is common.

My own experience, however, while it bears out Dean's statements in nearly all respects, has not shown to my own satisfaction that general sinusitis is common in children between the ages of 2 and 4 years; I mean an involvement of other sinuses than the ethmoid cells.

Ethmoiditis is fairly common in children between the ages of 2 and 4 years, and I have seen it in a small number of infants between the ages of 6 and 8 months, and in a larger number of children between the ages of 1 and 2 years.

Sinusitis in young children is frequently overlooked, partly because of the difficulty of making proper nasal examinations, and also because the discharge from the infected sinus runs into the throat and is swallowed.

Arthritis and multiple arthritis in young children is practically always the result of a focal infection somewhere, and in my experience this is most frequently in the ethmoid cells or in some other sinus. Diseased tonsils also play an important rôle in this respect, but I believe that the tonsil has been blamed a little too much. It should not, of course, be overlooked.

The most frequent causes for ethmoiditis in young children are common colds and the infectious diseases, scarlet fever, measles, influenza and diphtheria.

Besides the influenza bacillus, *Diplococcus pneumoniae* of Weichselbaum has been found frequently in suppurations of the sinus during influenza.

The pathogenic rôle of this organism was explained by E. Fraenkel's investigations regarding the bacterial content of normal accessory sinuses. In twenty-eight normal sinuses, he found *Diplococcus pneumoniae* most frequently, so it seemed that in pathogenic conditions it was largely a question of an increase in the number of bacteria existing in the sinuses under normal conditions.

Hajek viewed with skepticism the records of some American writers who reported large numbers of cases of sinus infections in patients in the earliest years of childhood. He spoke of the "fantastic reports of hundreds of cases by American writers," and said that he does not agree entirely with Dean in regard to the relationship between diseased tonsils and adenoids and sinus infections. I shall not take up the merits of Hajek's criticism; it is a fact, however, with due respect to this author, that disease of the sinuses in young children is far more common than a review of the literature would indicate.

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4. Dean: Tr. Am. Laryngol. A., 1918.

I think it will be agreed also that Dean's paper published ten years ago was a decided forward step in the knowledge of the subject.

Hajek's work in two volumes, written in collaboration with Heitger and Hansel, is one of the most complete and comprehensive studies so far published on inflammatory diseases of the accessory sinuses.

Another important etiologic factor is malnutrition in infants. This not only is true for the ethmoid cells, but applies also to the mastoid.

Recent investigations have shown the prevalence of mastoiditis in cases of malnutrition in infants. The presence of an involvement of the mastoid has been discovered at autopsies in many cases of malnutrition.

Children with tuberculous tendencies are also susceptible to disease of the sinuses. The investigations of E. Fraenkel and Wertheim have proved this to be true in adults also.

Young infants do not appear to be susceptible to attacks of influenza, but in older children this disease is a frequent cause, and the inflammation of the sinuses so frequently accompanying influenza may present the characteristics of a primary infectious condition. Sinus involvements, with other infectious diseases, are practically always the result of secondary infections. It was determined by Lindenthal that in influenza the influenza bacillus appeared almost constantly in accessory sinus suppurations, and that sometimes it was found alone without any admixture with various other bacteria. Wolff found that in diphtheria of the upper air passages the accessory sinuses were nearly always involved.

Coakley [5] stated that when a chronic nasal discharge exists in a young child, with an absence of adenoids, the presence of sinus disease is fairly positive. The majority of the cases of sinusitis in children under 4 years of age are ethmoid involvements.

Skillern [6] considered this to be true in children under 5 years old.

Roentgenograms sometimes show a surprising development of the other sinuses as well in children after the third year, and this fact is borne out by Mosher's [7] investigations. He considered the maxillary antrum, for example, to be large enough for surgical intervention in some cases after the third year.

According to Hajek,[8] the cells of the ethmoid labyrinth result from the formation of septums in the interturbinal passages. These septums undergo varying degrees of development; at times, they exist in the

5. Coakley: Tr. Am. Laryngol. A., 1914.

6. Skillern, R. H.: Sinusitis in Infants, J. A. M. A. **69**:895 (Sept. 15) 1917.

7. Mosher: Tr. Am. Laryngol. A., 1914.

8. Hajek, M.: Pathology and Treatment of the Inflammatory Diseases of the Nasal Accessory Sinuses, St. Louis, C. V. Mosby Company, 1926.

form of small ridges at the bases of the passages, and at times they protrude markedly and bound cavities which communicate with the interturbinal passages by small openings.

Congenital syphilis in young children should not be overlooked as a cause for disease of the ethmoid sinus, particularly when necrosis is found. In such cases, a Wassermann test should always be made.

Ethmoiditis is not uncommon as a result of hay-fever in young children, and is a complication of other nasal neuroses as well.

I have been impressed with the number of sinus conditions, particularly ethmoid and maxillary, that develop in young children after diphtheria, measles and scarlet fever.

A history commonly obtained when a child is brought for examination is that there had been a good deal of nasal discharge since the child recovered from one of the foregoing diseases, even in the absence of a cold. Sinus disease during and after the acute exanthems and influenza and diphtheria has been a recognized fact for a long time. One of the most complete investigations along this line was that of R. M. Pearce, published many years ago, who described a series of autopsies performed at the Boston City Hospital on children who had succumbed to measles, scarlet fever or diphtheria.

Autopsies revealed pus and other indications of sinus disease in the different nasal sinuses in a large percentage of the cases.

Transillumination in sinus disease in infants and young children is not satisfactory. Roentgenograms, although occasionally a little misleading, offer the best method of arriving at at least a fairly positive diagnosis.

REPORT OF CASES

CASE 1.—*Acute ethmoiditis with orbital abscess and exophthalmos.*

V. H., aged 6 months, was referred to my service in the Child's Hospital from Hudson, N. Y., on Dec. 30, 1926, with the history of a mucopurulent discharge from the right nostril for a short time before admission. This had apparently followed an ordinary cold but had not subsided. There was a gradually increasing edema and redness of the lids and displacement of the eyeball. The swelling of the upper lid increased considerably, and incisions were made, followed by a free discharge of pus. On examination the same day the infant was admitted to the hospital, a fistulous opening was found in the lid near the inner angle; it was discharging, and pus could be squeezed from it at any time. The exophthalmos (displacement of the eyeball forward and downward) was one of the most extreme I had ever seen. There was an extensive chemosis of the conjunctiva. A diagnosis was made of a probable ethmoiditis, with rupture through the lamina papyracea, and this was later confirmed by the roentgenogram. Dr. Judge, the attending ophthalmologist to the hospital, was called in consultation, and his report is included.

Swelling of the right eye appeared on December 21, rather suddenly. The eyes were normal prior to that date. The infant was seen the same day by Dr. Lawrence Early, who advised the parents to consult Dr. Wheeler of Hudson,

N. Y. Dr. Wheeler advised the application of cold compresses to the eye. On December 23, both ears were opened by Dr. Wheeler. Pus was not obtained after myringotomy. Swelling of the right eye continued to increase, and on December 25, Dr. J. L. Edwards made several incisions above into the orbit. On December 28, another incision was made, downward and outward. The child had had a cold in the head several days prior to the time Dr. Early was called.

Dr. Early's diagnosis was "orbital abscess secondary to ethmoiditis."

On admittance, the patient showed a typical picture of abscess of the right orbit, with characteristic exophthalmos, marked chemosis and tenseness of the lid structures, together with a marked chemosis of the bulbar conjunctiva. The cornea showed an irregular, round central ulcer, 5 mm. in diameter. There was a small piece of gauze drainage in each wound. These were discontinued. Hot compresses were ordered at twenty minute intervals every fourth hour together with a drop of 25 per cent mild silver protein and a drop of 1 per cent atropine. A bandage was applied to the eye constantly. After several days' treatment there was an increase in the exophthalmos and swelling of the orbital tissues. On January 18, the tissues of the upper lid again had a tense red appearance, as if there were a small abscess just below the skin. This area was incised, but only a sanguinous serum exuded. Hot compresses were applied daily until February 13, when the area of corneal ulceration had healed and the swelling had completely disappeared from the orbital tissues. Several days after the drainage was removed from the upper and lower outer incisions, the wounds healed in. The small wound at the upper inner aspect of the orbit continued to yield a thick purulent material.

On March 22, an external operation was performed by Dr. Thiesen. The compresses were continued until June 30. The patient was discharged August 15. The sinus closed up prior to discharge and the eye was normal.

It was impossible to make a satisfactory nasal examination, so after a few days the child was given a little ethyl chloride merely in order to allow the making of as complete a nasal examination as possible. We found a fair amount of a mucopurulent material in the middle meatus. On careful probing, I thought I could feel slightly roughened bone in the region of the anterior ethmoid bone. We were not anxious to perform a radical operation in so young an infant, so for a while we tried conservative endonasal treatment. Mild irrigations and a spray of a weak solution of ephedrine sulphate (solution 10) which I have found more useful than either cocaine or epinephrine hydrochloride in reducing the congestion of the nasal mucosa were employed. These measures did not have any effect, the condition of the eye becoming steadily worse and the exophthalmos increasing, so we finally decided on the external operation. I use the Killian incision, not the complete incision, however, for such a young infant. In older children, and depending on the severity of the orbital involvement, the incision may have to include part of the eyebrow. The Killian incision also has the advantage that the orbital ethmoid cells can be reached easily.

The roentgenograms in this case revealed one fairly well developed ethmoid cell which had the usual whitish, cloudy appearance of a diseased cell.

We found at the operation that a probe could be passed through the lamina papyracea, where the rupture into the orbital cavity had evidently occurred. One anterior ethmoid cell which was already fairly well developed and contained some pus was also found. The postoperative history of this case was uneventful. The child was in the hospital for a long time after the operation, during which time the eye gradually improved and the exophthalmos subsided fairly rapidly. The eye was normal in appearance when the child was discharged.

CASE 2.—*Orbital abscess following ethmoiditis.*

An infant, aged 10 months, presented a condition almost identical with that of patient 1, with the same history of a persistent nasal discharge from the right nostril. The only etiologic factor found was a cold (a rhinitis) before the appearance of the nasal discharge. The symptoms of the eyes, chemosis of the bulbar conjunctiva, swelling of the lids and exophthalmos, were noticed first about ten days after the onset of the nasal discharge, so that the condition was fairly acute. The rectal temperature ranged from 100 to 104 F. The parents refused to take the child to a hospital, so the operation was performed (under protest) in the patient's home. The child was kept under careful observation for several days prior to the operation, during which time mild nasal irrigations followed by a spray of a weak solution of ephedrine sulphate were administered. There was an increase in the exophthalmos during this time which, however, was not as marked as it was in case 1.

About all that was determined on nasal examination was the presence of a mucopurulent secretion in the middle meatus. The same external operation was performed as in case 1 and again it was possible to find a perforation through the lamina papyracea and a purulent secretion in the anterior ethmoid cells. There were two well developed ethmoid cells, which fact was also determined by the roentgenogram prior to operation. There was little postoperative fever and no postoperative complications. The possibility of a postoperative meningitis was feared in both cases, but fortunately that unpleasant and fatal complication did not occur. The swelling of the lids, chemosis and exophthalmos disappeared completely, and during the two years that the child has been kept under observation there has not been any recurrence. Warm packs, a compression bandage and mild silver protein were used in the treatment of the eye complication.

CASE 3.—*Ethmoiditis, great swelling of the lids and inflammation of the eye; orbital abscess, exophthalmos, with an infiltration and swelling in the inner angle of the eye pointing to external rupture of the ethmoiditis.*

In a child, aged 10 months, it was impossible to determine a definite etiology except a preliminary cold. The child presented a marked appearance of malnutrition and was in bad physical condition, probably furnishing good predisposing causes for the ethmoiditis. There was considerable inflammation of the conjunctiva and so much swelling of the lids that they could not be opened by the patient; they had to be raised before a view of the eye could be obtained.

Roentgenograms showed cloudy ethmoid cells. There had been a discharge from the left nostril for several weeks, the eye symptoms having appeared suddenly a week before the child was seen. The nasal examination offered the difficulties that it always does in infants, but a mucopurulent secretion was seen in the middle meatus. The child was sent to the hospital, and the usual external operation (Killian incision) was performed. Before the external incision was made, a thin silver cannula, attached to a large hypodermic syringe was carried into the swelling in the inner angle of the eye, a little weak permanganate of potash solution being injected. Some of the purple fluid escaped into the nostril, the rupture proving through the paper plate. The postoperative history was uneventful; no complications arose. A mucopurulent secretion was found in the anterior ethmoid cells at operation. The exophthalmos cleared up slowly but completely, as did the inflammation of the lids and bulbar chemosis.

CASE 4.—*Ethmoiditis of the right side; eyelids edematous and inflamed; chemosis of bulbar conjunctiva; no exophthalmos; localized infiltration and swelling in inner angle of eye.*

An infant, aged 12 months, an inmate of the Infants' Hospital, had had snuffles for a week or ten days, with considerable discharge from the right nostril. The roentgenogram showed definite involvement of the right anterior ethmoid cells. Permanganate solution injected into the swelling in the inner angle under ethyl chloride anesthesia showed in the nostril, pointing to rupture through the lamina papyracea. Eye treatment prior to operation was the same as that given in the other cases with mild nasal irrigations followed by sprays of a weak solution of ephedrine sulphate. As no improvement resulted after a week's treatment, and the eye condition did not improve, the external ethmoid operation was performed. The child made a good recovery. The child had a slight swelling and tenderness on pressure in the right knee joint without doubt secondary to the ethmoiditis. This condition cleared up slowly after the operation.

CASE 5.—*Ethmoiditis, orbital abscess and exophthalmos.*

An infant, aged 18 months, seen in private practice, presented a history of a cold, followed by a persistent discharge from the left nostril. The mother said that the eye symptoms started about ten days after the onset of the nasal discharge. The eyes presented the usual picture of an orbital abscess, exophthalmos, marked chemosis of the lids and conjunctiva and slight corneal ulceration. The usual plan of treatment for the condition of the eyes prior to operation was followed. The roentgenogram showed positive ethmoiditis, with involvement of the anterior cells. An external operation was performed on the ethmoid bone. The patient made a good recovery. The exophthalmos and symptoms of the eyes cleared up without any postoperative complications.

CASE 6.—*Bronchopneumonia, ethmoiditis, double mastoiditis.*

An infant, aged 20 months, was seen in St. Margaret's Hospital during an attack of broncho-pneumonia, for a double otitis media, following a left-sided nasal discharge. Both tympanic membranes were incised, following which there was free drainage, but double mastoiditis developed. One roentgenogram was positive for mastoid involvement; another showed well developed anterior ethmoid cells with definite ethmoiditis. Eye complications were not present in this case. A double mastoid operation was performed, as by this time the infant was well over the attack of pneumonia.

No operation was performed for the ethmoiditis. The same nasal treatment as was given in the other cases was used with good results. The child made a good recovery.

I have found ephedrine sulphate, after irrigation of the nose with a mild warm saline solution, of the greatest benefit, and have followed this course of treatment as a matter of routine in all cases of sinusitis in children both before and after operation. In most cases, this treatment has been sufficient without any operation. The ephedrine solution reduces the congestion of the mucosa so promptly and the effect is of such long duration, that I have found the use of tampons unnecessary except in some older children.

CASE 7.—*Diphtheria with offensive discharge from nose during and after the attack.*

A boy, aged 7 years, seen by me two months after he was apparently well following an attack of diphtheria, had a rather profuse discharge from the left nostril. The middle meatus was full of pus which apparently came from the left anterior ethmoid cells and maxillary antrum. The involvement of these sinuses was confirmed by a roentgenogram. Cultures from the nose showed streptococci and diphtheria bacilli. The diphtheria bacilli were found in every culture and were finally definitely located in the antral discharge. Eye or orbital

complications were not present in this case. The antrum was washed out a number of times after puncture through the inferior meatus. The ethmoiditis cleared up following simple endonasal treatment.

The interesting thing about this case was a constant finding of diphtheria bacilli in the antral pus for over a year from the time the patient was first seen. Guinea-pigs were inoculated, with negative results; so the Klebs-Loeffler bacilli were apparently innocuous.

It was finally necessary to perform a radical operation through the canine fossa and remove all the diseased antral mucosa, after which the antrum cleared up, and no more diphtheria bacilli were found in the cultures.

COMMENT

No other cases will be reported in detail. All my other patients, and this is true of the majority of all infants and young children with ethmoiditis, recovered following simple intranasal treatment directed at bringing on better drainage and aeration of the affected cells.

Most of my roentgenograms were taken in the Infants' Hospital, where there are between 200 and 300 infants and young children between the ages of 3 months and 6 years. Among this number of patients there are always cases of sinusitis which present favorable opportunities for observation.

The roentgenograms were taken for the purpose of studying the sinuses at different ages, and evidences of sinus trouble were found in many cases, in some of which it had not been suspected. In children under the age of 4 years, the condition was practically always an involvement of the anterior ethmoid cells.

In five children between the ages of 3 and 4 years, foreign bodies in the nose, causing inflammatory changes with persistent nasal discharge, were probably responsible for the ethmoiditis. In three children beans were found high up in the nose, and in two, small buttons were recovered. How long the foreign bodies had been in could not be determined, as the children had a nasal discharge when they were admitted to the hospital. In some children between 3 and 4 years old, the roentgenograms showed surprisingly large maxillary sinuses.

The anterior ethmoid cells were well developed in nearly all children between 2 and 5 years old, and in a few infants between 5 and 8 months old.

All cases with chronic persistent nasal discharge in the absence of acute colds were regarded as suggestive of sinusitis, and in many of these the diagnosis was confirmed by roentgenograms. In three of the thirty-one cases in which thorough investigations were made, mastoiditis developed, following ethmoiditis and acute otitis media.

The violet ray treatment has been found a most valuable adjunct in the treatment of children who were in a weakened condition and had sinusitis. Unfortunately, many of the infants are in the worst

possible physical condition when they are brought to the hospital. A good many are malnourished, and these children seem peculiarly susceptible to colds and to ethmoiditis. This class of patients was particularly benefited by the violet ray treatment, which they were given every day. It appeared to have a beneficial effect on the ethmoiditis, but without nasal treatment at the same time it would probably not have been so effective. One could also determine positively the great physical improvement in all the infants who received the daily violet ray treatment. Mild suction also appeared to be of some benefit in some of the older children.

Any form of treatment which improved the aeration of the sinuses, such as a spray of a weak solution of ephedrine sulphate, was of great benefit to the children. Ephedrine seems to be safe and without any of the unpleasant effects of epinephrine hydrochloride.

The roentgenograms showed a development of the frontal sinus in only a few of the infants between 1 and 2 years old. There were a few exceptions to this rule, however. As the frontal sinus embryologically in its process of development is really an offshoot from the ethmoid labyrinth, and is not much larger than a bean at about the fifth year, it is easily understood why roentgenograms may not be clear in this respect. In exceptional cases it might also be operable at a younger age than we believe, so that in cases of ethmoiditis in young children the possibility of its involvement must not be lost sight of. The advantage of the Killian incision in the external ethmoid operation is that the frontal sinus, if present, can be explored at the same time.

In the six cases reported in this paper in which the radical external ethmoid operation was performed, frontal sinuses were not found; as a matter of fact, in only one case could it be determined that a frontal sinus had reached a sufficient development to be called one.

In regard to the choice of operation, whether intranasal or external: In children in whom a chronic latent empyema of the ethmoid cells exists the intranasal operation might be indicated, but only if no complications exist. As stated before, I am an advocate of the utmost conservatism in dealing with the ethmoid labyrinth in children, and believe that an operation should not be performed until all conservative methods of intranasal treatment have been tried.

In cases in which the empyema of the ethmoid cells has ruptured externally, as in cases of orbital abscess, the external operation is indicated. In such cases, conservative methods will not do any good.

In very young children the tampon treatment is not satisfactory, owing to the difficulty of placing it properly against the ethmoid capsule in a struggling child. In older children this method of treatment, if persisted in, is often followed by good results. In older children with ethmoiditis one occasionally sees polypi, and in such cases it is

often necessary only to remove the polypi. The discharge from the cells of the ethmoidal labyrinth stops without the employment of any further measures.

I have rarely found it necessary to remove any part of the middle turbinal of a child with ethmoiditis, and would urge the greatest conservatism with respect to this procedure also. In adults it is an entirely different matter.

Owing to difficulties in orientation even in skilled hands, however, neither the endonasal nor external ethmoid operation should be attempted unless one is thoroughly familiar with the anatomy, and has had considerable of the necessary preliminary work on the cadaver. The danger of the endonasal operation in children even in the most skilled hands is great.

True nasal polypi are not common in ethmoiditis in children, but one sees, probably as the result of the chronic discharge from the ethmoid cells, soft polypoid granulations in the ethmoid region. The removal of such granulations is often all that is necessary to provide better drainage.

The great majority of children with ethmoiditis will recover spontaneously in time, if nature, assisted by gentle intranasal treatment, is given half a chance.

It was rather difficult, considering the various organisms that are always present in the nose, to determine any predominating organism in my cases of ethmoiditis.

In the 20 months old child in whom ethmoiditis and double mastoiditis followed bronchopneumonia, nasal cultures showed a diplococcus, probably *Diplococcus pneumoniae*.

In the cases following scarlet fever and measles, nasal cultures showed *Streptococcus aureus* as the main organism.

The hemolytic streptococcus was isolated in cultures in two cases, and Klebs-Loeffler bacilli were found in the cultures from the nose in three cases. The cases in which the hemolytic streptococcus is found appear to be unusually severe.

My investigations of the sinuses of children in the Infants' Hospital were carried out mainly because there were so many cases of acute conditions of the ears, mastoiditis and inflammatory conditions of the eyes and lids, with some orbital abscesses, after apparently trivial colds. Most of the infants had simply had "snuffles," and there were few acute conditions of the throats, so that it was thought that there must be some focus of infection responsible for the severe complications of the ears and eyes. Roentgenograms were then taken of the sinuses of a great many infants and I was surprised at the large number which showed definite ethmoid involvement. In many of these cases, the ethmoiditis

had not been suspected. I came to the conclusion that this must have been the primary source of infection responsible for many of the acute conditions of the ears and eyes.

In the cases of ethmoiditis in young children with external rupture, the rupture usually occurred at the inner angle of the eye, with the appearance of an infiltration and swelling. In older children this occurs, as a rule, as the result of a more or less chronic process in the ethmoid cells, but in young infants, as in the cases reported in my paper, spontaneous external rupture may follow closely an acute ethmoiditis. In these patients a probe can be passed into the nasal cavity through the lamina papyracea.

CONCLUSION

I would again advocate the utmost conservatism in the treatment of infants and young children with ethmoiditis. Radical operations on the ethmoid bone, except in cases in which there is evidence of external rupture and severe eye and orbital complications or other severe systemic conditions, should not be performed until all conservative methods of intranasal treatment have been carried out. I have come to view all cases of persistent nasal discharge in young children and infants, in the absence of acute nasal colds, as possibly sinusitis, and in children under 4 years old as probably ethmoiditis.

A persistent nasal discharge, occurring with and after scarlet fever, measles or diphtheria, is nearly always an indication of sinus involvement.

LOWER NASAL DEFLECTION

A NEW OPERATION FOR ITS CORRECTION

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The bugbear of surgeons doing nasal plastic work is the so-called twisted nose. The removal of a hump, the filling in of a saddle defect, the shortening operation—these operations are comparatively simple. Twisted noses, however, are rather difficult to correct.

Noses may be deflected from their normal line in the center of the face to one side or the other or to both sides at the same time. These deflections may be of the entire nose (from the nasofrontal junction to the tip), or the deflection may occur only in that area included in the nasal bones or in that included in the nasal cartilages. The latter deflections, made up of the nasal cartilages, will be discussed in this paper.

I have tried several methods, in which I have limited myself to various manipulations of the septum, and although some improvement has been noted, it has not been satisfactory. I then began to study the anatomy in these cases with a view to devise a proper method of correcting the cosmetic and often breathing errors. A marked twist of the lower part of the nose always causes difficulty in breathing, and a submucous resection does not usually correct this difficulty.

SURGICAL ANATOMY

The nose, a pyramid of skin, muscle, bone and cartilage, lined with mucous membrane, is for surgical purposes divided into two parts: the upper stationary or bony portion, ending in what is known as the pyriform fossa, and the lower, slightly movable or cartilaginous portion. The cartilaginous portion fits into the pyriform edge or fossa. In the displacement under consideration, only the lower cartilaginous portion is being considered. This consists of the nasal bridge or dorsum of the nose (from the edge of the nasal bone and nasal processes of the superior maxilla down to and including the nasal tip); this portion rests on the quadrilateral cartilage (septal cartilage) which rests on the vomer. The inferior border of the quadrilateral cartilage is attached to an anteroposterior cartilaginous strip by fibrous tissue. This strip is called the columella. Both of these structures divide the base of the nose into two compartments or nostrils. The lateral surface of the base of the nose is composed of the greater lateral cartilage and the lesser lateral cartilages held together and attached to the pyriform margin by

dense fibrous tissue. There are four greater cartilages, two on each side, the upper and the lower lateral cartilages. The upper lateral cartilages (nasal or triangular, one on each side) are continuous anteriorly with the anterior border of the quadrilateral cartilage, attached above to

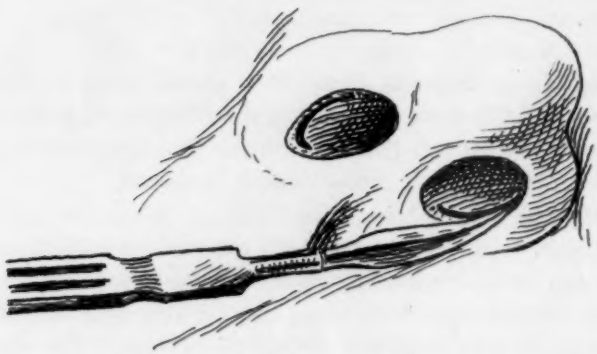

Fig. 1.—A lower lateral nasal deflection; incision made within each nasal vestibule.

Fig. 2.—The skin is separated and lifted up from the nasal tip to just above the margins of the nasal bones and the nasal processes of the superior maxilla.

the nasal bone and superior maxilla, and below to the other main cartilage of the nasal wall (the inferior lateral or greater allar cartilage). The inferior lateral cartilages are bent on themselves and form the medial and lower nasal walls. A portion of the lower lateral cartilage from the

medial wall meets a similar structure from the opposite side and also forms part of the columella; they are attached to the upper lateral maxilla by dense fibrous tissue within which are embedded the sesamoid cartilages. The margin of the alae of the nose is made of dense fibrous tissue without any bones or cartilages.

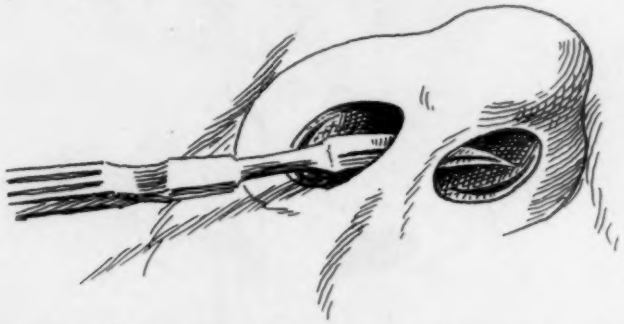

Fig. 3.—The knife is inserted between the quadrangular cartilage and the columnar cartilage, separation to be complete anteroposteriorly.

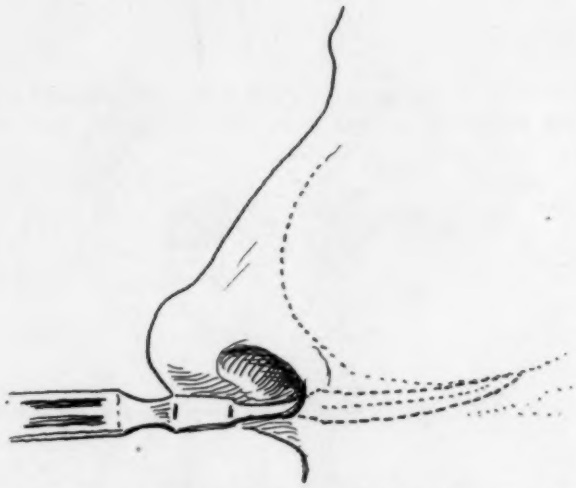

Fig. 4.—Quadrangular septal cartilage exposed and separated from its bed near the vomer.

TECHNIC

Step 1: With a knife, an incision is made in the outer wall of one nasal vestibule directly below the lower lateral cartilage just above the sinus vestibule, and with a sharp dissector, or better still, the special Joseph knife—double-edged and curved on the flat—the skin covering the lateral cartilages is lifted up and the skin of the dorsum of the nose is separated from the tip just above the free margins of the nasal bones.

Step 2: The same procedure is repeated in the opposite nostril. The skin over the entire area to be corrected is now elevated and free.

Fig. 5.—The knife is inserted under the skin protruding inward and separating the nasal bones and nasal processes of the superior maxilla from the triangular cartilages.

Fig. 6.—The lower nasal tip is pushed over to its corrected position (center line) and the right lower lateral cartilage pushed over into the right nostril.

Fig. 7.—The protruding piece of the right lower lateral cartilage, removed by scissors and a suture within the nostril.

Fig. 8.—Sutures applied reuniting the columella with the nasal septum.

Fig. 9.—The nose in central position.

Step 3: An incision is made through the nasal septum, from one nostril into the other, the quadrilateral cartilage being separated from the columnar cartilage. This separation extends from the nasal tip down to the base of the nose. In a mild case, this procedure is sufficient, and with slight pressure one can push the lower part of the nose over to the proper median line; sutures may be so applied that the obtained new position will remain. In a more marked case, however, further surgical intervention must be undertaken.

Step 4.: The mucosa over one side of the septum is lifted up and the quadrilateral cartilage exposed (its lateral view). If a submucous resection is necessary, it can be performed. If not, the cartilage is severed at its base where it joins the vomer (by cutting through it, but not through its mucosa of the other nostril).

Step 5: With a sharp Freer's dissector its edge bent more at right angles than usual—or a Watson's tonsil knife, the edge of the nasal bones and nasal processes of the superior maxilla is divided from their attachment to the greater lateral cartilage and to the quadrilateral cartilage. This is performed by inserting the instrument beneath the already lifted skin, the edge of the knife or dissector pointing inward. There are still cases which are very severe in which a perfect correction will not be accomplished until the following procedure is performed.

Step 6: The lower lateral cartilages are incised into each nostril, and then proper replacement is always accomplished. This replacement, in order to stay in position, must be secured by the procedures given in step 7.

Step 7: The quadrilateral cartilage is properly sutured to the columella and the lateral cartilages stitched into their new position. Sometimes, in order to avoid a slight intranasal irregularity which may result from an excess of one of the lateral cartilages protruding into one of the nostrils, a small section of it must be excised. This is always performed on the side to which the nasal tip has been shoved. A suture is here introduced. The cuts in the other lateral cartilages are left to granulate and will soon be covered by normal mucosa. These sutures are preferably of fine silk or horsehair, and the knots should be tied on the side toward which one has replaced the nose. The method of suturing and where to place the knots are important. To lessen tension on these sutures, the tip is also kept in its new position by strips of adhesive plaster, which are worn from about five days to a week. The sutures are moved at the end of seven days. Perfect asepsis, if possible, must be adhered to during all operations on the nose and especially in these plastic operations. An infection is a dangerous complication. This operation can be combined with that of shortening, hump removals and other operations for nasal defects.

2009 Pine Street.

DIAGNOSIS AND TREATMENT OF CHRONIC MAXILLARY SINUS INFECTION

EXTENSION OF TECHNIC TO INCLUDE CONTROL OF HEMORRHAGE BY LIGATION OF THE TERMINAL BRANCHES OF THE INTERNAL MAXILLARY ARTERY AND RESECTION OF THE MIDDLE MEATAL WALL GIVING OPERATIVE APPROACH TO THE ETHMOID AND SPHENOID SINUSES *

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Many factors are considered in making a diagnosis of chronic maxillary sinusitis. The most important are: (1) history, (2) symptoms, (3) physical observations, (4) x-ray examination, (5) cytologic examination and (6) irrigation. Space will allow me to dwell briefly on only a few points.

A history of frequent so-called "colds" is usually elicitated from a patient suffering from chronic sinusitis. In my work I come in contact constantly with an erroneous idea, held both by the laity and by many of the medical fraternity, in regard to repeated and recurring so-called "colds." A cold is a self-limited disease. No one suffers from repeated attacks in rapid succession, and one attack confers a definite immunity that lasts usually from six months to a year. When so-called colds recur in rapid succession, one is dealing with subacute or chronic sinusitis.

Among the symptoms, discharge is the most important evidence. Patients will often deny the presence of discharge. The idea commonly prevalent that a certain amount of running of the nose is normal leads to denial when a patient is asked if he has nasal discharge. All are willing to admit the presence of catarrh, that enigmatic condition, but discharge is frequently denied. It must be explained to the patient that the nose can be blown, or at least cleared posteriorly into the nasopharynx as well as forward out of the nostrils. It is important to see the handkerchiefs of the patients under observation. I make a practice of having the patient bring to me on firm, white cloth the nasal discharge, keeping separate on three cloths marked right, left and throat what they are able to collect from the right and left side of the nose and from the nasopharynx. The presence of purulent or mucopurulent discharge from the nose is diagnostic of sinus infection, admitting a few easily diagnosticated exceptions, such as a foreign body or ozena. Infec-

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* From the Department of Otolaryngology, Stanford Medical School.

* Read before the American Laryngological, Rhinological and Otological Society, May 4, 1928.

tion of the sinus does not exist without discharge. The secretion, it is true, may be simply watery to the naked eye over long periods. Usually, however, nearly all patients will show some yellowish discharge at intervals, macroscopic evidence of the presence of polymorphonuclear leukocytes. Microscopic examination of the clear discharge will generally disclose the presence of lymphocytes, evidence of chronic inflammation.

Among the physical observations, I merely mention that purulent or mucopurulent discharge may or may not be seen in the nose. One is dealing with a disease frequently limited to extranasal regions and therefore cannot expect to see the discharge in its passage through the nose. When the discharge is scanty, the following facts are helpful in gaining evidence of its presence. In an absolutely healthy person, polymorphonuclear leukocytes or lymphocytes are not found in any appreciable numbers in the mouth, the pharynx, the nasopharynx, the nose or the accessory sinuses. It is true that certain pathologic processes other than sinus disease can be responsible for the presence of such cytology. I refer, for example, to pyorrhea, caries of the teeth, diseased tonsils and adenoids. In practical experience with many cases, I have found that such causes for the presence of polymorphonuclear leukocytes and lymphocytes are easily eliminated. A swab made from the nasopharynx showing such cytology is almost diagnostic of the presence of disease of the sinus, while a swab made from the nose showing such cells in numbers is, in the great majority of cases, certainly diagnostic of the presence of sinus infection.

X-ray examination is of the greatest importance. Slight thickening of the mucous membrane can sometimes be made out. The gross changes in the mucosal lining are readily demonstrated. Fluid content is plainly shown, and this often can be made to change its level on altering the position of the head. Cysts and polypi are readily discernible.

Negative observations, even in the antrums where x-ray evidence is of the greatest value, must not be deemed conclusive in the presence of nasal discharge or cytologic evidence of chronic inflammation. Antrums with absolutely negative observations in the x-ray examination may show evidence of chronic inflammation in the cytologic examination. The x-ray department of Stanford Medical School has demonstrated by films, taken before and after, that the antrum may be emptied of discharge by blowing the nose.[1]

In making a cytologic examination,[2] it has been a common practice for years to enter the antrum with a trocar of some sort and to irrigate

1. Sewall, E. C.: External Operation on the Ethmosphenoid Frontal Group of Sinuses Under Local Anesthesia, Arch. Otolaryng. **4**:377 (Nov.) 1926.

2. Sewall, E. C.: Read before the Western Section of the Triological Society, 1927.

it, washing the contents of the antrum with the washwater out through the nose into a basin in which it is collected for study. Of all the methods of diagnosis this has been considered the most reliable. Hajek, for instance, in his excellent book recently published, goes so far as to say, "If the irrigating fluid returns clear, no mucus or purulent secretion is present in the antrum." This method, I have become convinced, is open to definite objections. It is not trustworthy. When there is enough discharge of a certain type in the antrum, it may be conclusive. It has been shown, however, that it often does not give any indication of the true content of the antrum. The following simple facts from a case observed by me show the inadequacy of this crude method. The x-ray, in this case, showed both antrums definitely diseased, with polypoid thickening of the mucous membrane. A no. 16 needle was introduced in the usual manner into the right antrum. A 5 cc. Luer syringe was fitted direct, and aspiration was performed. Air only was withdrawn, and this suggested that the antrum was empty. Sterile water was injected through and caught in a basin as it emerged from the nose. It was put into a glass and held before the light for observation and was absolutely clear. The same type of needle was inserted into the left antrum, and on withdrawing the piston, the 5 cc. syringe welled up with an opaque, viscid material. It was about the color of ground glass. This known, viscid material was next dropped into a glass of sterile water, and it disappeared instantly. I later operated on the antrums and found the mucous membrane thick and polypoid in both, as x-ray examination had shown. Pathologic material, therefore, accumulated in an antrum may be apparently completely soluble in water and therefore not recognizable by the ordinary methods of irrigation.

For years some physicians have insisted on using a black catch basin when washing out the antrum, contending that they noted disease that would be overlooked in a white basin. Just as the black basin is better than the white, so is the microscope or chemical reagent an improvement on the naked eye.

The ordinarily used method of irrigation not only is in error from the standpoint that it overlooks disease, but is objectionable because the return flow out through the nose may carry material lodged there from other sources.

It has been the practice of a few physicians for some years to inject sterile solutions into the antrum and to withdraw and examine them bacteriologically and, I think, chemically. These methods are excellent and productive of great help, but they require expert assistance to be of any reliability, and even then it is difficult to be certain of lack of contamination in the manipulation. After a number of years of trial, these methods have not come into popular use.

The method here described is simple and can be carried out in the course of office practice. It is based on the fact that mononuclear and polymorphonuclear leukocytes are never present in any appreciable numbers in healthy accessory sinuses. There are factors other than sinus disease that may produce these cells in the mouth and nasopharynx and possibly in the nose. As examples I mention pyorrhea, diseased tonsils, diseased adenoids, foreign bodies or atrophic rhinitis.

While this method of examination is original with me and has been used by me for about three years and was reported a year ago before the Western Section of this Society, I have since learned that the idea was first made use of by Watson-Williams,[3] and I take pleasure in giving him full priority.

METHOD OF EXAMINATION

Applied to the antrum, the method is as follows: The nose is cocainized underneath the inferior turbinate. A sterile, no. 16 needle, without handle or obturator, is introduced into the antrum in the usual manner. This is done most comfortably with the patient lying semirecumbent on a table. There is then practically no psychic disturbance or fainting. Care is taken not to pass the needle against the opposite antral wall, because it may cause bleeding. Blood, while confusing, is rarely encountered and can be distinguished under the microscope. When the needle is in place, a 5 cc. Luer syringe is connected directly, and the piston is withdrawn. If fluid appears, it is placed in a sterile tube for examination. If, however, air is drawn freely into the syringe, one may know that the point of the needle is free in the antrum and that the opening into the nose is patulous.

Twenty cubic centimeters of sterile water is warmed to a pleasant temperature in a small 40 cc. Florence flask; this size will admit the barrel of a 5 cc. Luer syringe. The head of the patient is bent well over toward the corresponding side in the position best favoring retention of the fluid in the antrum. The syringe is connected again, and the warm solution is injected slowly into the antrum. The patient is asked to tell if the solution is felt to go down the throat. After 5 or 10 cc., more or less according to the free available space in the antrum, has been injected, the piston is slowly withdrawn, and the recovered fluid is placed in a sterile test tube for examination. Both sides are usually studied, when necessary, at the same time, a separate flask of solution and another syringe, of course, being used.

When the fluid returned is contaminated sufficiently, a slide may be made directly from it. When there is little if any evidence in the returned solution, however, it is put into a centrifuge, and a slide is made from whatever may be deposited at the point of the centrifuge tube.

Normal antrums show no cellular content of inflammatory nature; low grade infection is productive of mononuclear leukocytes; while the more active processes furnish either polymorphonuclear leukocytes alone or polymorphonuclears mixed with mononuclear cells. Or in the same antrum one may find pus lying on the floor containing only the poly-

3. Watson-Williams, P.: Brit. M. J. **2**:894 (Nov. 14) 1925.

morphonuclear type of cell, while above the pus the cavity of the antrum may furnish a preponderance of round cells in the injected and aspirated fluid. This is exemplified in the following case.

The patient complained of a yellowish nasal discharge. The x-ray pictures showed a fluid level in the right antrum with mucous membrane thickening. A needle was introduced into the right antrum, and aspiration was performed; only air filled the syringe. It was evident that the point of the needle was above the level of the pus. Sterile fluid was now injected and aspirated. The return fluid was centrifugalized and showed a preponderance of round cells. The needle was now made to engage the pus. This was thick, and only a little could be withdrawn into the syringe. The returned mucopus was found to contain only polymorphonuclear leukocytes. Fluid was then injected through the antrum and collected in a dish as it came from the nose. The washwater was clear, but a yellow mass appeared at the anterior naris. This was pulled out with forceps and consisted of a mass of thick, yellow mucopus. The observation of the two kinds of cells, practically unmixed, found at the same time in the same antrum seems to be of considerable importance. The mucopus itself was composed mostly of polymorphonuclear leukocytes. It was thick and kept its place in the lower part of the antrum when the patient was upright, but was affected by gravity on change of position of the head. The remaining part of the antral cavity had recovered from the more acute inflammation and furnished only round cells. These round cells were probably washed from the walls of the sinus by the injected solution which even came in contact with the thick mucopus. The mucilaginous character of the mucopus held the polymorphonuclear leukocytes from mixing with the injected solution. This method has proved that many antrums are diseased that formerly would have been considered normal. Many interesting facts have been elicited that have given new ideas concerning diseased antrums. When the antrums have been operated on, the mucous membrane is examined histologically, and this check has been invaluable in estimating pathologic changes. My co-workers and I find that the x-ray is of the greatest aid in diagnosis, and we apologize for the heated arguments we formerly had with the x-ray department when we were given a report of "great mucous membrane thickening in the antrum," and washed through and saw nothing in the washwater. Except in the cystic variety, we rarely find true mucous membrane thickening without finding the cause for it in the cytologic study.

Cystic degeneration of the mucous membrane is an interesting pathologic condition. The cyst may fill the antrum completely and, if so, the needle introduced taps the fluid, and it runs out freely like fluid from an ascitic abdomen. Cysts of large size are often shown in the

x-ray plates, rising up free in the antrum. It has been possible to pass the needle into the antrum, missing the cyst; injection and withdrawal of the solution have shown accompanying disease when present. Then the needle has been made to engage the cyst and to rupture it, returning the typical, yellow fluid characteristic of the content of the cyst. We have introduced the needle into the antrum, withdrawn the piston, getting nothing but air. Then, on filling the antrum with our solution and withdrawing again, we have obtained thick, yellow mucopus in large quantities. The needle evidently passed above the level of the pus.[4]

It is also common to find it impossible to withdraw the piston after connecting with the needle. This is due to one of three things: 1. The needle has become clogged. If that is the case, the sterile obturator is passed through the needle, removing the obstruction. 2. The point of the needle is engaged in thickened mucous membrane or possibly thick, inspissated discharge. It may be freed in some cases by moving the point of the needle about until an open space is found. In some instances, the antrum may be so filled with polypoid tissue or thickened secretion that aspiration is impossible. In such cases, the x-ray will show that the antrum is entirely opaque, although it may not be able to distinguish in such opacity between mucous membrane thickening and fluid. The following case illustrates the limitations of the needle puncture as a diagnostic measure. The x-ray showed that the left antrum was opaque in this patient. It was impossible to tell whether there was thickening of the mucous membrane. The needle was easily introduced into the antrum, but aspiration or movement of the piston of the attached syringe was impossible. At operation, the antrum was found entirely filled with inspissated pus. It had almost the consistency of the heavy grease used in automobiles. When placed in alcohol, it closely resembled polypoid mucous membrane. The mucous membrane in this antrum was hardly thickened, although a little edematous. 3. The opening into the nose has become clogged by the thickening of the mucous membrane in the sinus or in the nose. Sometimes there is a valvelike action which permits air or fluid to pass in one direction but not in the other.

Great care is taken in all these manipulations not to inject any air until we are sure of the position of the needle because of the danger of air embolism.[5] We are usually able to aspirate air which decides that the needle is free in the antrum.

The cytologic study of antral content is especially useful in considering cases in which there are repeated exacerbations of infection of the

4. This observation was made by my associate, Dr. J. A. Bacher.

5. Bacher, J. A.: California State J. Med. **21**:433, 1923.

antrum. Low grade inflammation, as shown by mononuclear cell content, is frequently present continuously between the acute attacks.

It should be made plain that operative indications are not necessarily based on the observations of mononuclear or polymorphonuclear leukocytes in the sinus. These data are added to the other clinical factors that determine the judgment of the surgeon. We frequently examine patients at intervals over long periods to ascertain whether the chronic inflammatory process is constantly present.

METHODS OF TREATMENT

Certain general measures may be helpful in the treatment of patients with chronic sinus disease. Most patients are benefited by a warm, dry climate, and this agency should be made use of when practicable. When it is not possible to enjoy such warm, dry weather, conditions about the patient should be made as favorable for cure as possible. After years of endeavor, it has been possible to educate the public concerning the advantages of fresh air. The laity has been persuaded to sleep outdoors or, when that is unpractical, to have the windows as widely opened as weather conditions permit. It has been found, however, that cold air cold water or chilling of the body from any cause is unfavorable for patients suffering with sinusitis. These persons progress much better in warm air and when they do not swim or become chilled. Local treatments that tend to decrease the swelling in the nose and promote drainage are reasonable therapeutic agents.

Operative measures in the nose and throat for the purpose of improvement in the general condition besides affording greater freedom to respiraion are often indicated as constructive expedients. Irrigations of a chronically infected antrum may at times effect a cure. When the history indicates a process of long standing and when the x-ray shows thickened mucosa lining the sinus, the cure is apt to be more apparent than real. Macroscopically, the patient may recover, but if a cytologic examination is made, cellular evidence of chronic disease persists.

It is not always wise or necessary to operate on an antrum even though the presence of chronic disease has been determined. The employment of surgical measures for the cure of patients with chronic disease in the antrum is dependent on the condition in the antrum and also, in many cases, on evidence of disease in other parts of the body attributable to the focus in the antrum.

When an operation on the maxillary sinus is indicated, the operative technic generally employed is essentially the Caldwell-Luc method with certain improvements and extensions.

To Jansen is given the credit for priority in the transantral approach to the ethmoids and sphenoid.

I described before the Western Section of this society, in 1927, the routine removal of the middle meatal wall with the method of attack on the ethmoid and sphenoid sinuses when diseased in performing a radical operation on the antrum.

When isolated disease of the antrum exists, the removal of the middle meatal wall, without interference with the ethmoids, adds materially to the chances of cure because of the better aeration and drainage of the sinus. It also acts in a beneficial capacity when, because of a large inferior turbinate, the postoperative swelling interferes with drainage through the inferior meatus. Disease in the antrum, however, is unfortunately often associated with infective processes in the upper groups of sinuses. It is pretty well agreed that the antrum rather than the upper sinuses should be operated on first. Sometimes an ethmoid infection will clear up after an antrum has been cured. Frequently, however, the upper sinuses will continue to be diseased, and such cases can usually be prognosticated from the intranasal appearance and the x-ray pictures.

An antrum that has been operated on may serve as a reservoir for pus coming from the upper sinuses, and the condition may fail to improve on that account. It is, therefore, mutually helpful in work on both the ethmoid and antrum to clear up as much disease as possible at one operation. The following case will illustrate the advantage in having a method that will allow the reaching of more diseased areas than those in the antrum. The essential facts of the case were as follows: The patient had chronic pansinusitis with acute exacerbation, high temperature and pain over the left side and back of the head. The location of the sinus responsible for the high temperature and dangerous condition was not possible, except that the symptoms all pointed to the left side. The left antrum was filled by thickened mucous membrane and discharge. A radical operation was performed on the antrum, and thick, polypoid mucous membrane and pus were found indicative of chronic disease of the antrum, but there was not evidence enough to account for the grave symptoms. The middle meatal wall was removed, and the ethmoid sinuses cleaned out as far as possible; the sphenoid sinus was also opened. The bursting forth of pus under pressure from that sinus gave evidence that the sphenoid was the source of the grave condition.

Perhaps the most important and useful part of this technic is the possibility of reaching, opening and draining certain infra-orbital ethmoid cells that otherwise cannot be adequately eradicated. I refer to the cells of the ethmoid mass or vertical process of the palate bone that extend outward over the upper and posterior part of the maxillary sinus. These cells can be opened medially intranasally, but dependent drainage can be obtained only by resection of the upper medioposterior wall of

the antrum which forms the anterior or inferior wall. These cells are well demonstrated in the x-ray plates.

Until some other method of treatment takes the place of surgical measures, thorough drainage of all diseased cells must be the aim. The postoperative discharge, crusting, polypi or granulation tissue, as well as unpleasant symptoms, result from inefficient drainage due to the technical difficulties encountered in overcoming problems presented by anatomic and pathologic factors. In cases of pansinusitis which require a comprehensive method of procedure from the beginning, I am in favor of the following plan of attack:

1. A radical Caldwell-Luc operation with removal of the middle meatal wall.

2. Ligation of the terminal branches of the internal maxillary artery as they enter the nose.

3. Exenteration of the infra-orbital or supra-antral ethmoid cells. Exenteration of as many other cells of the ethmoid as can be reached. Opening and drainage of the sphenoid with as much attention to the floor as can be given through this approach.

4. At a subsequent operation, when required because of pansinusitis, an external frontal ethmosphenoidectomy, an osteoplastic flap being used, should be performed to take care of the frontal sinus and complete the work on the ethmoid cells and sphenoid.

TECHNIC OF OPERATION

The operative procedure through the canine fossa is as follows: The patient is given a light breakfast, for example, a piece of toast and a cup of coffee. One hour before operation he is given $\frac{1}{100}$ grains (0.0006 Gm.) of scopolamine and ¼ grains (0.0167 Gm.) of morphine sulphate. (This is modified somewhat by body weight.) The patient lies on the back on the operating table with the head slightly raised. One per cent procaine hydrochloride, to which 5 drops per ounce of epinephrine have been added, is injected along the gingivolabial junction and under the cheek, the needle hugging the bone as closely as possible. The nasal cavity is cocainized thoroughly with crystals of cocaine caught up on a small swab soaked in epinephrine.

An incision is made at the junction of the lips and gums, and the periosteum is elevated (fig. 1). The anterior wall of the antrum is penetrated with a small chisel. A punch is inserted and the opening made as large as desired. On account of the teeth, the opening is kept up as high as thorough work in the antrum will permit.

For many years I stood out against this approach to the antrum except in unusual cases, because I feared the consequences to the teeth. Recognizing this as the ideal antral approach, I was finally convinced by the work of others, particularly that of Bricca, that the teeth are rarely permanently damaged.

When the antrum is entered, the mucous membrane is carefully studied. There is no blood, and every detail stands out sharply. The observations are compared with the x-ray and the clinical picture. Great strides toward an understanding of the pathologic changes in the antrum have been made since this method of operating under local anesthesia and subsequent microscopic study of the lining mucosa have been employed.

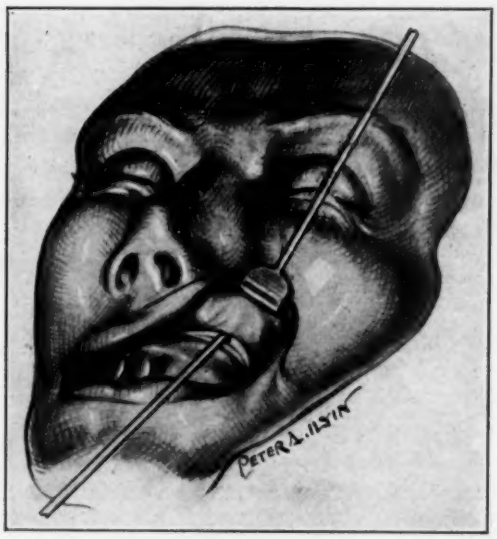

Fig. 1.—Upper lip retracted; incision and beginning elevation of periosteum.

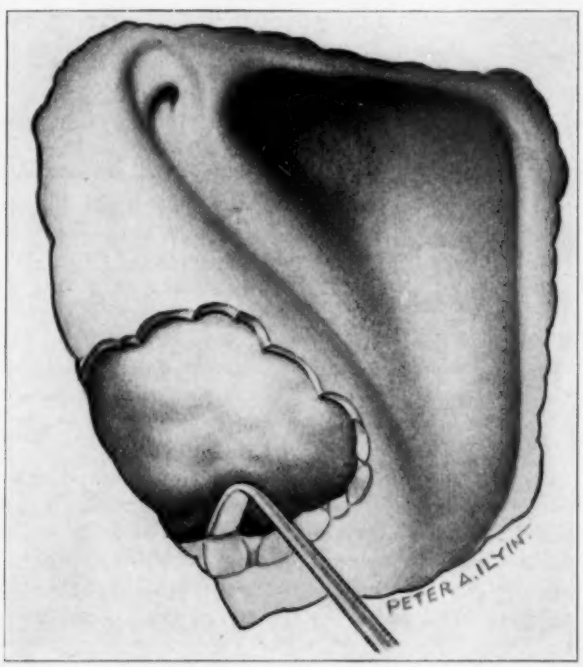

Fig. 2.—Opening has been cut in naso-antral wall; nasal mucosa being raised to prevent its injury when lowering bony opening.

The antrum is now swabbed with a little cocaine, and the mucosa is removed completely. No effort is made to free it from the wall about the fontanel where it is adherent, because what is left in that region is removed later with the meatal wall itself. I have devised a curved elevator that greatly facilitates the raising and removal of the mucosa.

The thin bone overlying the inferior meatus is cracked with a light blow of a chisel and quickly removed from the attachment of the inferior turbinate to the floor. In order not to injure the nasal mucosa of the inferior meatus, it is separated from the bone by the curved elevator referred to, before the bone is removed. The mucosa is also raised up from the floor of the nose so that the naso-antral wall can be chiseled well down, and even the floor lowered somewhat

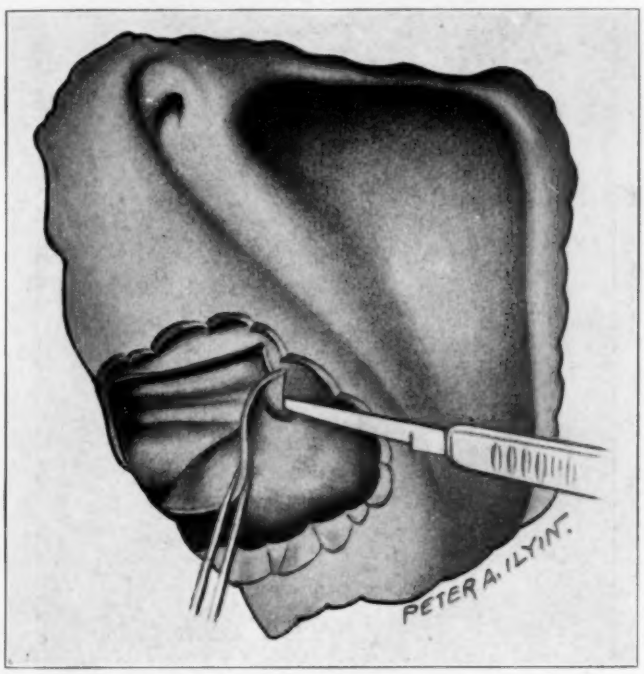

Fig. 3.—Technic of cutting the flap of the nasal mucosa. Inferior turbinate is seen through the opening.

without injury to the mucous membrane. This will allow the flap to lie flat and give the best possible drainage from the antrum (fig. 2).

The mucous membrane flap is now prepared from the nasal mucosa of the inferior meatus by cutting with a thin-bladed knife from the floor upward along the most anterior edge of the bony opening in the inferior meatus. This bony opening should extend well forward and can be made by small, flat chisels. After the anterior incision in the mucous membrane is made, the mucosa is grasped by thin forceps, and the rest of the flap, the full size of the bony opening, is quickly cut with the thin, sharp blade (fig. 3). This flap will now lie down on the antral floor out of the way. It is important that the inferior turbinate and nasal part in this region be traumatized as little as possible. This causes less swelling and better subsequent drainage.

The thin bone of the middle meatus back toward the posterior wall of the antrum is broken through and removed from the nasal mucosa. A thin elevator is worked through this bony opening, and the nasal mucosa is raised from the vertical process of the palate bone. By proceeding in this manipulation with caution, it is found that the terminal vessels of the internal maxillary prevent the elevation of the nasal mucosa where they enter the nose at the sphenopalatine foramen. The nasal mucosa can be removed from the under surface of the lateral ethmoid mass above the vessels and from the vertical process of the palate below them. A threaded hook can be passed about these vessels and the knot tied

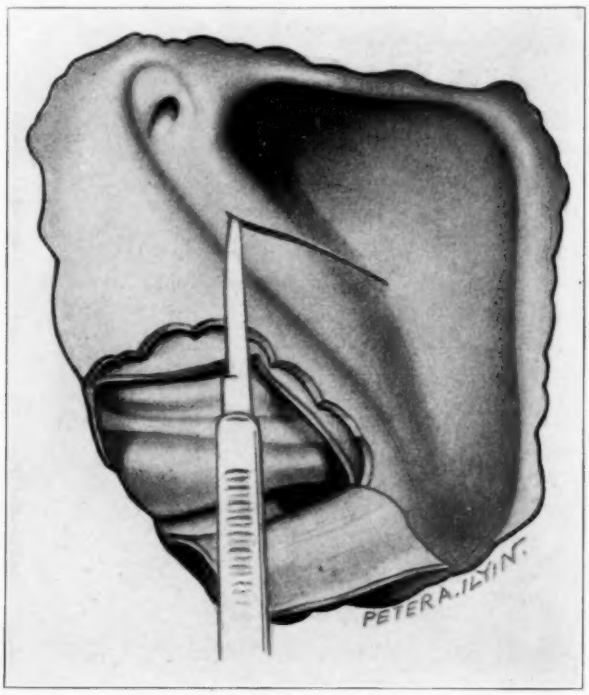

Fig. 4.—Incision through the middle meatal wall superior to and following the upper border of the inferior turbinate.

with the ring tyer. This method of tying is the same as that used for tying the ethmoid arteries in the fronto-ethmosphenoid operation.[3]

These terminal branches of the internal maxillary artery ligated after entering the nasal cavity are the posterior lateral nasal artery and the sphenopalatine artery. The posterior lateral nasal artery quickly divides into branches that supply the lateral wall of the nose including the turbinates. These branches anastamose with the ethmoid arteries and the nasal branches of the descending palatine artery.

The sphenopalatine is of especial importance because it passes across the body of the sphenoid to the septum. It must be ligated to prevent hemorrhage that makes impossible technic for thorough sphenoid drainage.

The ligation of these vessels controls the greater part of the bleeding in the nose. It is hoped that time will show that postoperative nasal bleeding, now a

Fig. 5.—Wall of middle meatus being removed.

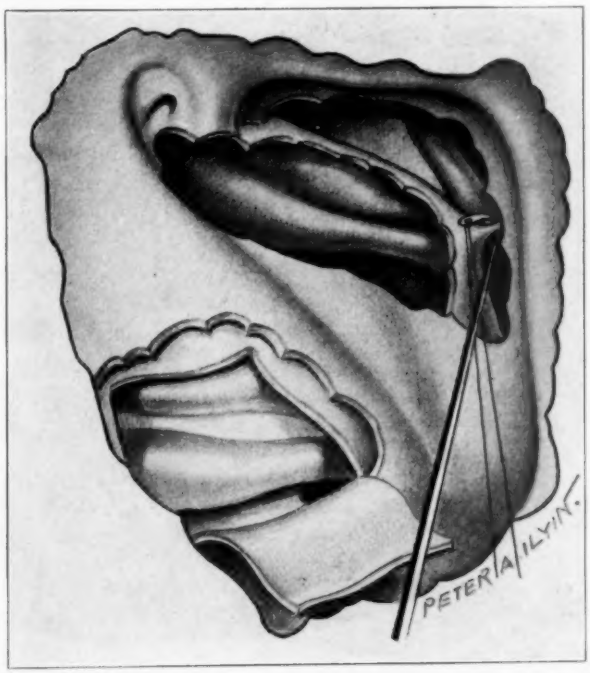

Fig. 6.—The bony middle meatal wall has been removed. The nasal mucosa is shown above separated and drawn downward from the under surface of the ethmoid mass, also downward and inward from the vertical plate of the palate bone. Dissection has also taken place from below upward until stopped by the terminal branches of the internal maxillary artery where they enter the nose. A ligature is being passed around these vessels.

Fig. 7.—The opening is seen in the inferior meatus. The flap of nasal mucosa is turned downward onto the floor. The inferior turbinate shows through the hole. The middle meatal wall has been removed, the terminal vessels of the internal maxillary artery have been ligated—sphenopalatine and posterolateral nasal arteries. The ethmoid cells have been exenterated, and large posterior ethmoid cell and sphenoid sinus show in the depth.

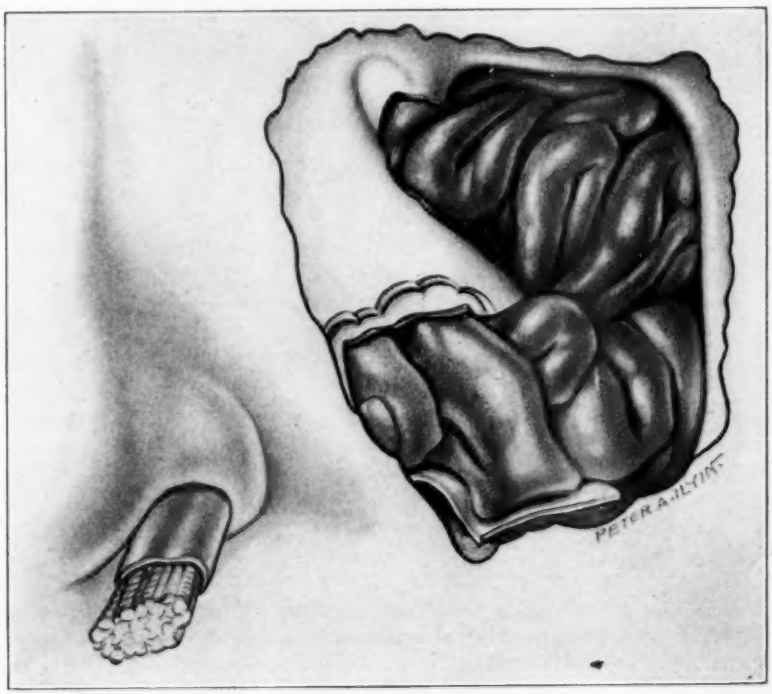

Fig. 8.—The flap of nasal mucosa is shown held in place by a rubber covered cigaret drain. The end shows presenting from the nostril. More packing is shown here than is ordinarily used.

serious and distressing condition the occurrence of which is left to chance, may be controlled with the same certainty that has been attained by ligation of bleeding vessels after tonsillectomy.

Before the emergence of the terminal branches of the internal maxillary artery in the nose, the descending palatine artery is given off. This is a large vessel that sometimes bleeds freely if cut in performing work on a cleft palate. This vessel is easily reached through the removal of the thin posterior wall of the antrum, and it can be ligated as it passes downward to its canal. This artery occasionally gives off a small branch that I have not found described in any text-book. It runs in the bone of the wall of the inferior meatus. This is the artery that causes unpleasant bleeding when the opening under the inferior meatus is cut back far enough to reach it.

An incision is now made with a narrow-bladed knife from behind forward through the thin bony and membranous wall of the middle meatus. This cut goes through into the nose and follows the upper border of the inferior turbinate (fig. 4). A thin elevator is now inserted in this incision, and the middle meatal wall is pried outward and the edge grasped in punch forceps and cut away (fig. 5). The whole wall is easily removed in this manner, and a view into the nose is had disclosing the outer side of the middle turbinate (fig. 6). The ethmoid cells are opened with a curet and ring punch external to the middle turbinate. The turbinate may be removed or not. A good exposure can be obtained, and the ethmoid cells can be reached, with the exception of the anteriorly placed and the supra-orbital extensions (fig. 7).

The sphenoid is opened, and the inferior wall may be removed. This part of the sphenoid operation is of the greatest importance and always presents difficulties. One is apt to be satisfied with less than the proper treatment of the floor of the sphenoid, especially when it is a deep one. The posterior part of the nasal septum may be removed, the partition between the two sphenoids taken away, the two cavities thrown into one and the combined floor removed as described in the technic used in ethmofrontal sphenoidectomy.[1]

The operation performed in this manner under local anesthesia and with ligation of vessels is practically bloodless. Packing is not required, but to hold the flap well down in place, I use a more or less rubber covered cigaret drain and bring the end out of the nostril (fig. 8). This is left in for from twenty-four to forty-eight hours, and is removed without pain because of the smoothness of the rubber covering.

Dr. Hunnicutt, my house officer, has taught me to use a continuous suture in sewing up the incision. It is quicker of application than the interrupted sutures formerly used and as satisfactory.

CYSTLIKE CAVITY IN THE NASOPHARYNX

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CHICAGO

In studying a postmortem specimen of an adult male, I noticed a peculiar condition in the nasopharynx. Instead of the mucosa being closely adherent to the bony vault of the pharynx, a cystlike formation was present in this region. It was attached in the midline to the posterior part of the sphenoid bone, just underneath the caudal portion of the sinus (sphenoid). Just lateral to each side was the fossa of Rosenmüller and the torus tubarius.

As far as could be determined, there was no connection with the sphenoid sinus, nor was there any tract leading from it toward the sella turcica. The floor of the sinus was smooth and level, not showing any bulging upward. In the dependent portion of the cavity was an opening leading into the nasopharynx. It was smooth and rounded and approximately 3 mm. in diameter.

The cavity was oval-shaped from above down. From the ostium upward to the sphenoidal surface, it measured 11 mm., and from side to side, at the greatest width, 7 mm. The wall of the cavity at the opening was quite thin, being about 1 mm. thick. Laterally and superiorly, it became thicker, increasing to about 3 or 4 mm. That portion adjacent to the floor of the sinus was extremely thin, measuring probably 0.5 mm. In the lumen of the cavity was an oval body 4 by 2 mm., of about the consistency of cheese. Microscopic sections of this revealed an acellular material, which was, no doubt, dried secretion.

In looking up the subject, I found that various views were held concerning the formation of these cystlike cavities, and, in view of the fact that microscopic sections were made of the wall of the cavity, I thought that it would be worth while to report this case.

Sections were made from the left side of the cavity from two regions: (*a*) near the pharyngeal opening and (*b*) near the attachment at the sphenoid (fig. 1). The sections showed the wall to be fairly thick, especially portion *b*, and to consist mainly of a lining epithelium toward the cavity side, a vascular region and externally a lymphoid layer.

The lining epithelium was desquamated in part, but that present appeared cuboidal. In two places (fig. 1), there was a glandlike dipping in of the mucous membrane. Here the epithelium resembled pseudostratified columnar epithelium. Just under the epithelium was a definite narrow layer of dense connective tissue. Beyond the latter began the wide, loose, vascular portion. Numerous sinusoids were seen, some

filled with red blood corpuscles. A smaller number of vessels with well developed walls were noted. In several regions, definite glandlike structures could be seen, part having undergone postmortem changes. One type of glandlike structure resembled the alveoli of a mucous gland (fig. 2), while another type was lined by tall columnar ciliated epithelium (fig. 3). Small lymphoid cells and plasma cells were scattered through-

Fig. 1.—Cross-section of wall of cystlike cavity. *a*, mucous membrane, with glandlike dipping in at a^1; *b*, connective tissue layer; *c*, lymphoid layer, with lymph follicle at c^1; × 48.

out, but were sparse in certain areas and more numerous in others. In the former regions, the connective tissue matrix was quite prominent.

The outer or lymphoid layer consisted mainly of a fairly dense mass of small lymphoid and plasma cells, with here and there smaller and larger lymph follicles; blood vessels and sinus-like spaces were also seen. In portion *b*, the lymph follicles were quite prominent and numerous.

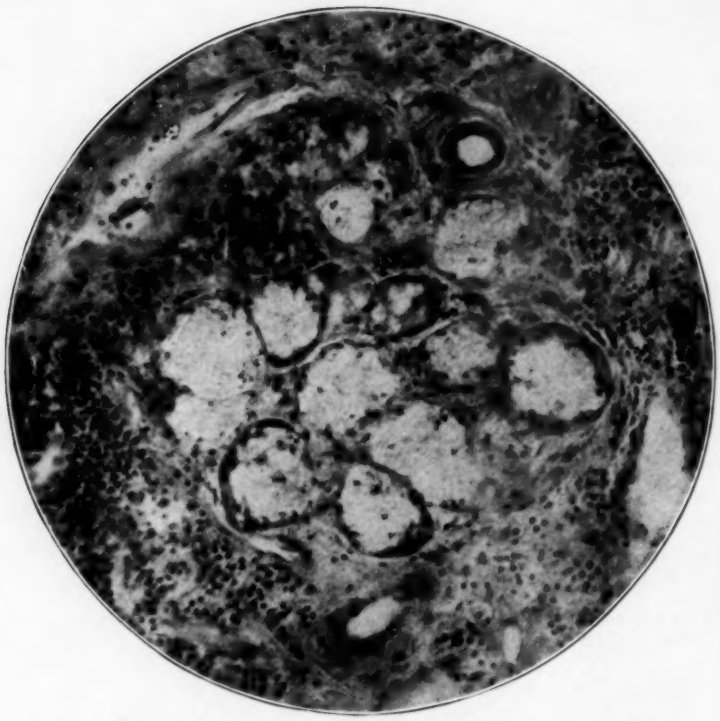

Fig. 2.—Glandlike structure, resembling mucous gland; × 200.

Fig. 3.—Glandlike structure, showing columnar ciliated epithelium; × 135.

COMMENT

From the foregoing description it is evident that on gross examination the case represented a cystlike cavity of the nasopharynx, one which was productive of a secretion, as evidenced by the dried mass found in the lumen of the cavity. Microscopically, several points can be emphasized: (*a*) the wall was essentially lymphatic; (*b*) it was vascular; (*c*) several types of glandlike structures were seen, and (*d*) there was no evidence other than that it was a benign structure.

In the literature, it is evident that various opinions have been held as to the origin of cystlike formations in this region. Among the possibilities mentioned are: (*a*) pharyngeal bursa, (*b*) obstruction of a mucous gland, (*c*) remnant of the adenoid, (*d*) Rathke's pouch and (*e*) Sessel's pouch.

I do not believe from the study made that a definite conclusion can be drawn as to the origin of the cavity. As far as could be determined from the history, the patient, who was 70 years of age at the time of his death, had never had any symptoms referable to the nasopharynx.

30 North Michigan Avenue.

THE TREATMENT OF DYSPHAGIA IN TUBERCULOSIS OF THE UPPER AIR PASSAGES

REPORT BASED ON ONE HUNDRED CASES *

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The control of pain on swallowing in tuberculosis of the larynx is often a difficult problem for the laryngologist. As long as the patient is in good general condition, when intralaryngeal operations are still feasible, this most troublesome symptom may easily be controlled by proper local treatment. If, however, a large part of the larynx is ulcerated and the sputum contains many tubercle bacilli, intralaryngeal procedures must be abandoned and other methods of treatment applied.

The present report deals principally with patients with advanced cases of laryngeal and pulmonary tuberculosis who are suffering from dysphagia. Many patients who starve themselves for fear of dreadful pain begin to show improvement in the general condition when they are again able to take nourishment. The first step in these cases, therefore, should be the relief of dysphagia.

This report covers the cases of about 100 patients treated during the last three years. Although the treatment may tax to the utmost the patience of the physician, his efforts are well rewarded by the results obtained. The patient is relieved of an excruciatingly painful symptom which is likely to throw him into profound despair.

The simplest and least effective treatment is the medical one. The continuous administration of cocaine, morphine, injections and insufflations affords temporary relief, which is often lost entirely when the patient gets used to them. The general condition is also often weakened thereby. I have limited this treatment to patients in whom the disease has spread from the larynx to the pharynx and mouth.

The only medication that one can still resort to is lactic acid, which affords relief that at times lasts a few days, but which often fails in badly ulcerated conditions.

ACTINOTHERAPY AND INJECTION OF NERVE WITH ALCOHOL

The most conservative method for the control of dysphagia seems to me to be actinotherapy with ultraviolet rays.

I use the Kromayer mercury quartz lamp. Results have not been obtained with the indirect rays reflected through the quartz tube attached

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to the lamp. The direct application of the rays is considered a severe strain on the patient by some laryngologists, particularly because of the use of the Killian suspension method. I have heard hardly any complaints from patients since I employed the Atkinson laryngoscope,[1] with which the diseased portions of the larynx can be made accessible for direct irradiation. The pressure of the Atkinson laryngoscope on the teeth and on other parts is not troublesome, which is an advantage to these sensitive and exhausted patients, who must retain the speculum for from five to ten minutes. I have noted satisfactory results from the use of the Kromayer lamp. Some patients report less pain after the first treatment of three minutes. In a series of patients treated by irradiation alone, the pain on swallowing was relieved, and the use of other methods was thereby made unnecessary. In another series of cases, the pain recurred when the irradiation had been discontinued for a longer period. A noticeable improvement in the laryngeal symptoms was observed only after frequent irradiation combined with other treatment. On such patients whose pain does not disappear or grows worse or on whom this treatment cannot be carried out, surgical measures must be resorted to. In a previous paper,[2] I stated that the quickest results may be achieved in many cases by the resection of the superior laryngeal nerve (sensory nerve of the larynx). This operation, however, should not be undertaken in extremely debilitated patients. In such cases, good results may follow the injection of the superior laryngeal nerve with alcohol.

This method, which was introduced by Hoffmann,[3] gives immediate relief from pain in many cases. However, the result is of uncertain duration, and the method is therefore not entirely reliable. Often the pain recurs with greater intensity after the injection. Besides, the injections are not entirely free from danger, as is ordinarily supposed. In the literature, little is said about such complications. Cases of necrosis of the larynx have been reported, in one of which a mediastinal abscess developed with a fatal outcome (Haardt[4]). In sixty patients whom I treated, I did not find such complications. In one instance, however, I saw paralysis of the tongue following the injection. The solution of alcohol which blocked the superior laryngeal nerve had also affected the hypoglossal nerve in this case. This is easily explained by an obser-

1. Callahan, J. F.: The Atkinson Tracheolaryngoscope in Examination and Surgery of the Larynx, Laryngoscope **36**:583 (Aug.) 1926.

2. Schugt, H. P.: Tuberculosis of the Larynx, Arch. Otolaryng. **4**:479 (Dec.) 1926.

3. Hoffmann, R.: Daueranaesthesie im tuberculoesen Kehlkopf, München. med. Wchnschr. **22**:739 (April 7) 1908.

4. Haardt, W.: Die Behandlung der Schluckschmerzen bei der Kehlkopftuberculose, Wien. med. Wchnschr. **77**:1032, 1927.

vation that I made during resections of the superior laryngeal nerve. I noticed that the hypoglossal nerve in some cases ran close to the laryngeal nerve (fig. 2). Shukoff [5] stated that this condition is especially noticed in people with short necks.

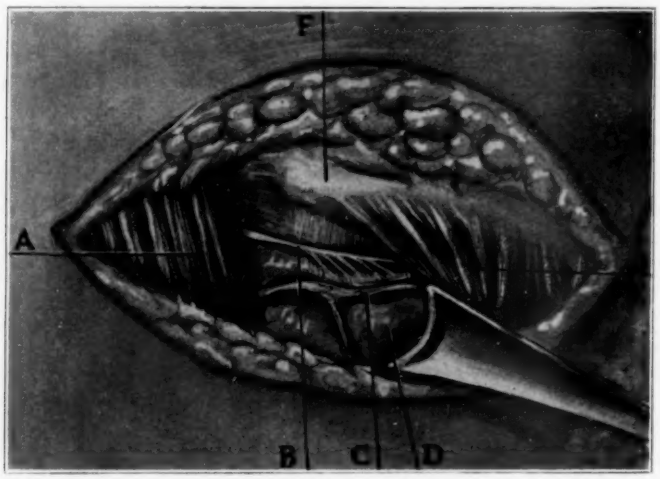

Fig. 1.—The fanlike distribution of the superior laryngeal nerve on the membrana thyreohyoidea. *A* indicates the musculus sternocleidomastoideus; *B*, the nervus laryngeus superior; *C*, arteria laryngea superior; *D*, cartilago-thyreodea; *E*, musculus omohyoideus and sternohyoideus; *F*, os hyoides.

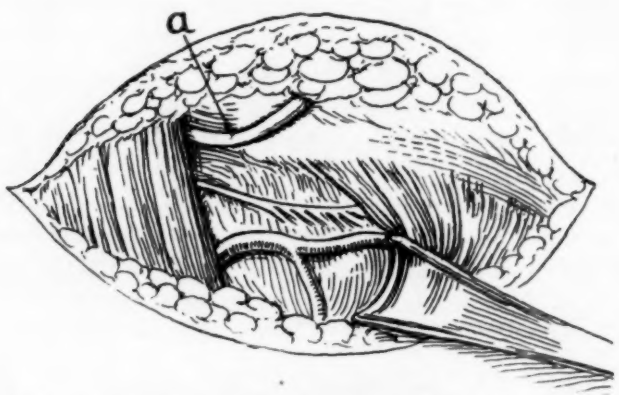

Fig. 2.—Unusual course of the nervus hypoglossus close to the nervus laryngeus superior. *A* indicates the nervus hypoglossus.

After the injection, edema of the larynx frequently forms on the affected side, extending in some cases from the sinus pyriformis to the

5. Shukoff, G.: Resektion des Nervus laryngeus superior bei Larynxtuberkulose, Ztschr. f. Hals-, Nasen- u. Ohrenh. **4**:3, 1923.

arytenoid cartilage. This fact should be a warning against using the injections on both sides at the same time, as bilateral edema of the larynx may lead to a dangerous dyspnea. In one of these cases of bilateral simultaneous injection, I was forced to perform a tracheotomy. As stated before, the injections of alcohol according to Hoffmann are not entirely reliable. A number of authors, therefore, have devised modifications of his method (Leichsenring [6] and Blumenthal [7]).

Blumenthal introduces the needle on the inner surface of the thyroid cartilage, injects during the process of pushing the needle forward and hits the trunk of the nerve.

BLOCKING OF THE NERVE THROUGH THE SINUS PYRIFORMIS

Aurelius Réthi was the first to propose blocking of the superior laryngeal nerve with procaine hydrochloride in operations on the larynx in a location in which it runs most superficially, namely, in the pyriform sinus. Hutter [8] applied this method in a series of cases in which anesthesia of the larynx for a short period was indicated; he used procaine hydrochloride for the injection and recommended this method for injections of alcohol in persons with dysphagia from laryngeal tuberculosis. He injected alcohol in one case, but the patient was free from pain only half a day. I was persuaded by his experience to use the method on a number of patients. As nothing is reported [9] in the literature about injections of alcohol into the sinus pyriformis (except in the case of Hutter already mentioned), first of all I prepared a number of patients prior to cauterization of the larynx with procaine hydrochloride anesthesia of the nerve in its course through the sinus pyriformis. After that I decided to try to inject alcohol in this manner.

In order to get a clear idea of the subject, it seems advisable to view the anatomic structure of the portion of the larynx that is under discussion. A good description of the sinus pyriformis is found in Zuckerkandl's "Textbook of Anatomy":

> In the upper half of the sinus pyriformis there is often noticed a transverse fold running through the fossa (plica nervi laryngei Hyrtl) in which the laryngeal

6. Leichsenring, E.: Zur Behandlung der Dysphagie bei der Kehlkopftuberculose, Ztschr. f. Hals-, Nasen- u. Ohrenh. **2**:396, 1922.

7. Blumenthal, A.: Ueber Alcoholinjektionen gegen Schluckschmerz bei Larynxtuberculose, Ztschr. f. Laryngol. Rhinol. **16**:226, 1923.

8. Hutter, F.: Ueber paralaryngeale Anaesthesierung und innere Leitungsanaesthesie bei endolaryngealen Eingriffen, Ztschr. f. Hals-, Nasen- u. Ohrenh. **5**:209, 1923.

9. At one time Réthi (Die Therapie der Dysphagie bei der Kehlkopftuberculose, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **98-99**:125, 1915-1916) suggested crushing the nerve in the pyriform sinus with an appropriate instrument in cases of tuberculous laryngitis with dysphagia. As far as I am able to ascertain, the results of this method have not been reported.

nerve is enclosed. If the parts are not congested, the nerve will show through. The section between the plica nervi laryngei and the plica pharyngo-epiglottica of the sinus is shallower than the lower portions of the same (fig. 3).

In a great many examinations, I was able to distinguish the nerve as clearly as is shown in figure 3 in two cases only. In the shallow section is found a part of the stylopharyngeus muscle (fig. 4). The point of injection should be in the fold below the plica pharyngo-epiglottica, in which the shallower part of the sinus merges into the deeper portion

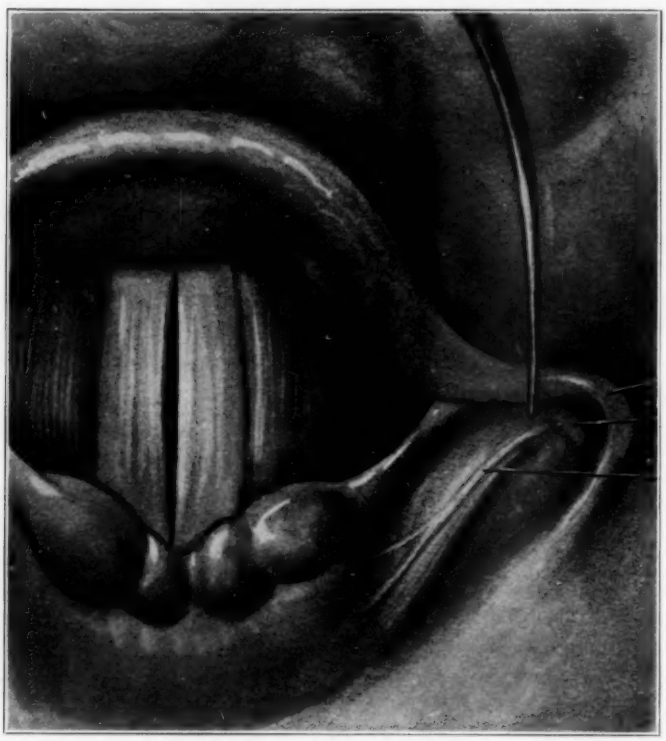

Fig. 3.—Unusually distinct picture of the pyriform sinus of a highly emaciated tuberculous patient. The probe points to the site of injection. *A* indicates the plica pharyngo-epiglottica; *B*, the os hyoides and *C*, the nervus laryngeus superior.

(fig. 3). I believe that in this manner the nerve will be found more easily in some cases than according to Hoffmann's method, for one is dealing with a much smaller area. When the sinus is moderately involved by disease and is swollen, the injection may be made through the swelling. After the injection (from 0.5 to 1.5 cc.), edema forms in the sinus pyriformis; this edema gradually disappears. It may be quite extensive, reaching over the aryepiglottic fold and the aryetenoid

cartilage of the same side, and may at times produce temporary hoarseness. The injections should not be performed on both sides at the same time as dangerous dyspnea may occur.

I generally make the injection by the indirect method with a curved cannula carrying a thin needle such as is used in the Alexander syringe. The direct method may be used, but I find the former more comfortable for both the patient and the physician. If morphine is administered

Fig. 4.—*A* indicates the plica pharyngo-epiglottica; *B*, musculus stylopharyngeus and *C*, nervus laryngeus superior. From Spalteholz.

before the injection and the sinus pyriformis is first slightly anesthetized with cocaine, special difficulty is not experienced. A number of patients complained of typical radiating pain extending into the ear, as is regularly noticed when the Hoffmann method is used. Having seen results from this method, I can recommend it as an aid in the treatment of persons with tuberculosis of the larynx. Injections of alcohol into the sinus pyriformis should be given a further trial, especially as nothing

is found in the literature about this method. Of course it will not replace the Hoffmann method, but it will at times be successful when the Hoffmann method fails. The cases most suitable for injection through the sinus pyriformis are the ones in which the sinus is not involved by disease.

RESECTION OF THE SUPERIOR LARYNGEAL NERVE

If the foregoing methods do not bring about the desired results, I recommend resection of the sensory nerve of the larynx, provided the general condition of the patient is not too unfavorable. I have reported the technic and results in detail in a previous study.[2]

The nerve is generally found running along the membrana thyreohyoidea with the arteria laryngea superior (fig. 1). It occurred to me a few times that in following the course of the artery, it is difficult to locate the nerve, while little difficulty is experienced if the artery is disregarded and the membrana thyreohyoidea is stretched by raising the hyoid with a retractor. This fact was so apparent that I proceeded to investigate the topographic anatomy of this nerve in its relation to the artery. I found that Bock,[10] in studying a large number of larynges, noted the inconsistency of the origin and course of the arteria laryngea superior, while the course of the nerve on the membrane is constant. It is important to have a clear idea about these anatomic conditions, for the quicker and the more skilfully the operation can be performed, the better for the debilitated tuberculous patient.

I have performed the resection on fifteen patients and obtained complete relief from pain on the side operated on in all but one. In addition to a severe tuberculous ulceration of the whole larynx, this patient had a large ulcer on the lingual side of the epiglottis. The resection of the superior laryngeal nerve could not be expected to give complete relief here, as the lingual part of the epiglottis is supplied by the glossopharyngeal nerve. These patients and others with involvement of the pharynx and buccal cavity offer the worst prognosis and suffer a great deal. Quartz light therapy, often useful in other cases, is seldom effective in these cases. Anesthesin, orthoform, cocaine spray and later the administration of morphine must be used to bring about temporary relief. As the pharynx and the posterior part of the tongue are principally supplied by the glossopharyngeal nerve (sensory fibers), attempts have been made to relieve the severe pain in these cases by paralyzing this nerve. Heidt [11] devised a method of approaching the glossopharyngeal nerve through the pharynx with a suitably curved needle for

10. Bock, F.: Ueber die Auffindung des Nervus laryngeus superior zum Zwecke der Resection, Ztschr. f. Hals-, Nasen- u. Ohrenh. **11**:541, 1925.

11. Heidt, C.: Anaesthesie des Nervus vagus und glossopharyngeus am Foramen jugulare, Monatschr. f. Ohrenh. **60**:897, 1926.

alcohol blocking. On account of the dangerous proximity of the vagus to the point of injection, I have hesitated so far to use this method. If in a case of tuberculosis of the pharynx surgical intervention is decided on, it seems to me that the incision from the outside and the cutting through of the glossopharyngeal nerve should be given preference. Locating the nerve is difficult, and the operation for that type of patient is a severe one. I have therefore hesitated a long time before resorting to this operation. A patient was suffering from intense pain on deglutition from an extensive tuberculosis of the pharynx and larynx. I first tried blocking both superior laryngeal nerves with alcohol to ease the pain. This effort was only slightly successful. As the pain in the pharynx increased in intensity, after a few fruitless attempts with quartz light irradiation and application of lactic acid, I decided to cut through the glossopharyngeal nerve on the left side, where the pain was especially intense. The pain was definitely relieved, but the patient soon died from pulmonary hemorrhage. Although the temporary relief from pain in these cases is highly desirable, I would not recommend this operation, because it is comparatively severe and is not as well borne by the tuberculous patients as the resection of the superior laryngeal nerve.

Tuberculous lesions in the buccal cavity are limited principally to the tongue, if lupus is not considered. As long as the ulcerations are small, the chances for healing are good. Local ultraviolet irradiations, lactic acid, internal administration of iodine, electrocautery or excision may cure small ulcerations. But tuberculosis of the tongue associated with tuberculosis of the larynx and pharynx is much more difficult to deal with. Even improvement is rarely obtained, as the tongue is again and again reinfected from the larynx and pharynx. One of my patients, who for several years was under my care for tuberculosis of the larynx, developed tuberculosis of the tongue, which in spite of local treatment kept spreading and finally extended from the tip of the tongue on the right side to the root of the tongue and the floor of the mouth, forming a wide, destructive ulceration. The pain became so severe that the patient was hardly able to swallow soft boiled eggs. I decided to cut the sensory nerve of the tongue on the affected side (nervus lingualis), as is proposed in inoperable cases of carcinoma of the tongue for the relief from pain. The patient, who was in a fairly good general condition, stood the operation surprisingly well. The pain in the tongue disappeared except at the base, and the patient was able to swallow more solid food.

Other methods advocated for relief from pain and possible cure of tuberculosis of the larynx may be mentioned briefly: roentgen-ray and radium therapy. I shall not go into details about them, as my report is concerned principally with patients requiring immediate relief from severe pain, whereas the roentgen ray and radium are effective only after some time has elapsed.

As seen from the foregoing statements, the elimination of pain in most cases requires the blocking or cutting of the sensory nerve of the affected part. The question arises whether such blocking has any ill effects on the tissue of the larynx. I have been unable to verify this point by microscopic examinations. In the literature, only one report, that of Hosoda [12] is available. After injection with alcohol or cutting of the nervous laryngeus superior, he found degeneration (atrophy and necrosis) in the mucous membrane, cartilages and muscles. He believed that the changes are due to trophic disturbances. In view of the fact that in the severe forms of dysphagia no other, or few other, effective methods of treatment are available, one must overlook these sequelae in a condition that in many cases is hopeless anyway.

In almost all my cases pain was either entirely eliminated or greatly diminished, except in the cases in which the condition extended to the pharynx and tongue.

I believe that resort to the foregoing simpler methods and if necessary to the surgical methods will save patients a great deal of suffering. With improvement in the general condition, at times an improvement of the larynx is noticed and a more active treatment of it can be undertaken.

The patient should receive all the necessary general medical care during these treatments, and a thorough cooperation should exist between the internist and the laryngologist.

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12. Hosoda, Chu: The Larynx After Resection or Alcohol Injection of the Superior Laryngeal Nerve, Japanese J. Oto-Rhino-Laryngology, May, 1923, vol. 29, no. 3; reviewed in Folia Oto-Laryngol. **25**:377, 1926.

Clinical Notes

A NEW TECHNIC FOR NASAL PLASTIC OPERATIONS

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Much has been written concerning the technic of plastic operations and many instruments have been introduced during the past few years; hence one hesitates about introducing something new, or presumably new, into the armamentarium of the plastic surgeon for consideration, until it has been used by other surgeons and has met with their approval.

The difficulties which were experienced in performing plastic surgical procedure on the nose by the old method have been the resecting of a piece of rib or the removal of a piece of costal cartilage. The time and energy consumed in resecting a rib and the danger of perforating the pleura seemed to me rather out of proportion, in view of the fact that after its removal the bone had to be shaped to the size required. Also, the removal of a piece of costal cartilage consumed an equally unreasonable amount of time and patience, combined with a large element of uncertainty as to whether the piece removed was going to fulfil the requirements of the case at hand.

A few years ago, after becoming thoroughly converted to the use of costal cartilage, I started search for a simpler and better technic of removing cartilage. My idea was to employ chisels, but it was impossible to get the surgical instrument houses to understand the type of instrument wanted. The answer came while watching some wood carvers work at an exhibition in New York. The chisels used by them seemed to be just the thing I was looking for. They were sharp, the proper size, well balanced, easily handled and could be sterilized.

I purchased some of these chisels and experimented with them on cadavers. The result was good. I found that they could be forced over the surface of the pleura without injuring it, and that the pleura was punctured only when a deliberate attempt was made to do so by forcing the chisel backward or downward at right angles to the wall of the chest. They would also deliver a piece of cartilage of a size, shape and thickness corresponding to the size of the chisel used.

This gave encouragement, but not having an unlimited supply of cadavers, it was necessary to find a substitute on which to practice. The large yellow turnip proved the best substitute, and after trying my skill on a number of turnips, using first one chisel and then two chisels of different sizes, I found that I could cut a piece of turnip similar to the size, shape and thickness of a piece of cartilage needed for nearly any case requiring a transplant. Going back to the cadavers, I found that the chisels worked as well on the costal cartilage, except that a little more force was necessary.

A large piece of cartilage might be tunneled to fit the nasal bone or beveled to fit the frontal bone. It might be thin on the end, thick in the center, or vice versa, with a contour similar to that of the normal nose. This could be accomplished before the piece of cartilage was completely removed

from the sternum, and was an advantage over the old method of getting a piece of cartilage by the use of a knife, elevator and a pair of forceps, and then attempting to shape it with various instruments at the time of operation—a procedure often requiring much time during which the patient was under an anesthetic.

It was also evident that the shapes removed by one or more chisels might be used for purposes such as the complete or partial reconstruction of a nose, the reconstruction of an ear, the formation of eyelids, postoperative frontal sinuses, deformities, elevation of depressed scars and the tunneling of soft tissue.

Fig. 1.—Chisels and a few of the different shapes which may be cut with these instruments (almost one-half actual size).

The chisels are shown in figure 1. They have been nickel plated and threaded on their shanks to fit the handles shown. As it is seldom necessary to use more than two chisels in an operation, only two handles were made.

The technic developed for the use of these chisels is as follows:

A plaster cast is made of the patient's face by the use of quick setting dental plaster. If the case is one of simple saddle-back nose, it does not take long to determine what steps to follow at the time of the operation. The cast, Joseph's rule, chisels and a yellow turnip usually solve the problem satisfac-

Fig. 2.—Method of measuring the length of a transplant.

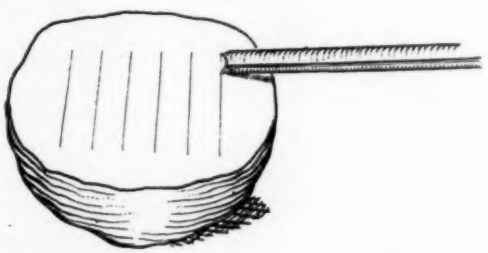

Fig. 3.—The lines made on the surface of a turnip prior to cutting models.

torily. The first step is to measure the distance from the frontal bone to the tip of the nose. Then one must decide whether the transplant is to be 4, 4.5 or 5 cm. This distance is measured on the cut surface of a turnip by a line drawn with a sharp instrument and four or five similar parallel lines 1 cm. apart are drawn below the first one made. Next the chisel or chisels are selected which will be suitable, and several pieces of turnip are cut; they are then applied to the area to be reconstructed and the result noted. When a satisfactory model has been cut, it is easy to duplicate it by knowing the

Fig. 4.—Application of a piece of turnip to plaster model to determine its fitness for the case.

depth the chisel reached in the first centimeter and each successive centimeter until the model was obtained. After the shape desired has been definitely decided on, it is well to practice cutting that particular shape as accurately and as quickly as possible. This is the shape of the piece of cartilage desired at the time of operation, and as the same technic is used on the exposed costal cartilage, if a piece of cartilage of that size and proportion can be obtained, the operation is going to be successful. I have made it a practice to preserve this model by covering it with paraffin, and taking it with me to the operating room for reference and comparison.

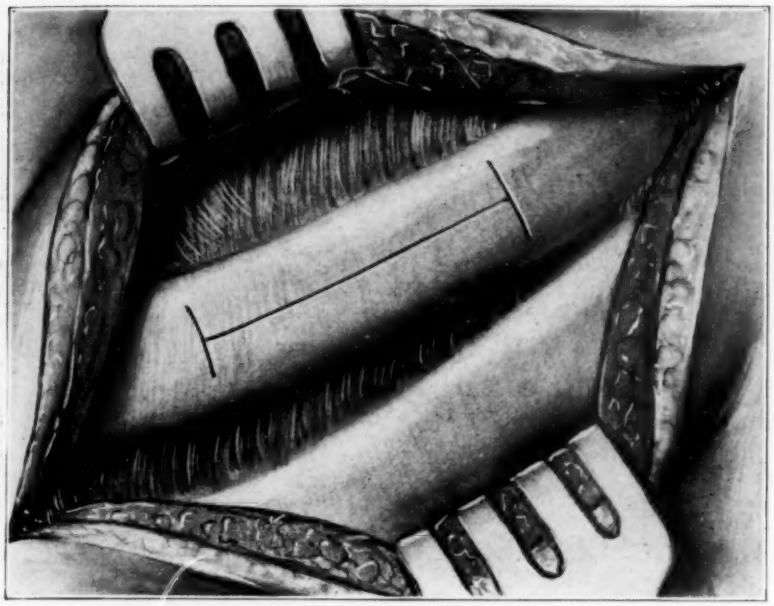

Fig. 5.—Exposure of rib with incisions made in the perichrondium.

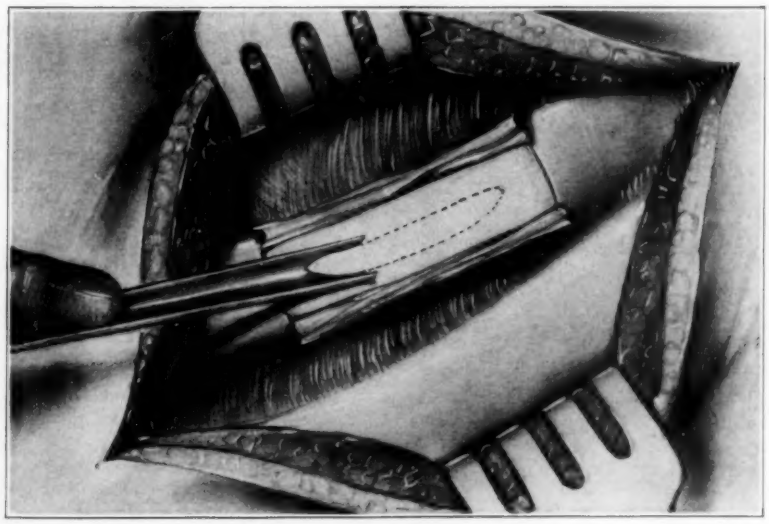

Fig. 6.—Method of removing cartilage for simple transplant.

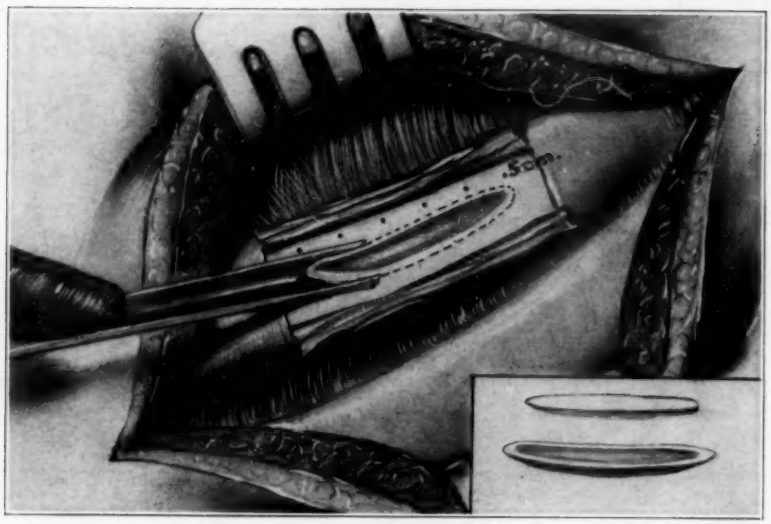

Fig. 7.—Method of removing cartilage for cases requiring the cartilage to be grooved.

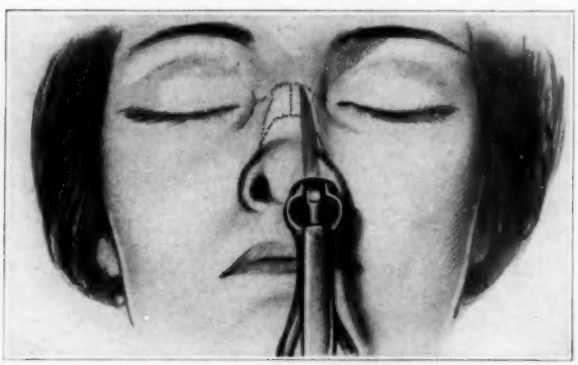

Fig. 8.—Method of elevating the skin over the dorsum of the nose for transplanting cartilage in operation for simple saddle-back nose.

If the nasal bones are prominent at any point or if the septal cartilage is poor, it is well to groove the cartilage before cutting it in order to make it conform better to nasal bones and prevent sliding.

If the case is other than that of a simple saddle nose, that is, one in which it will be necessary to remove a hump or a cartilage twist, or to remove some of the ascending process of the superior maxillae, a little different method is followed. In a case of this sort, a second mold is made, that is, a partial plaster mold of the nose, eyes and mouth of the original plaster cast. By

Fig. 9.—Method of placing transplant.

using plastine to fill this mold, one can make as many impressions of the nose as are necessary for the study of the case.

Markings are made on the plastine model to correspond to the position and size of the nasal bones and the ascending process of the superior maxillae. Then, with an ordinary spatula or clay modeling tool, the plastine is removed from the model at the points of election. This gives some idea of how the nose will look when these bones are removed. The next step is to cut from the turnip a model of the cartilage transplant to be made, place this in a position on the plastine model and one has something definite by which to judge the result of the operation.

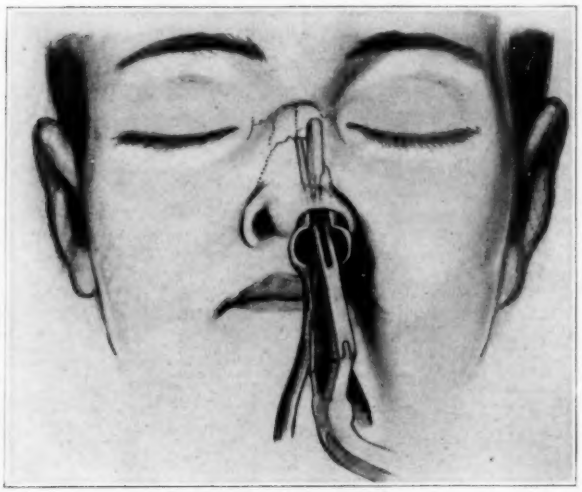

Fig. 10.—Method of removing irregularities of the nasal bones.

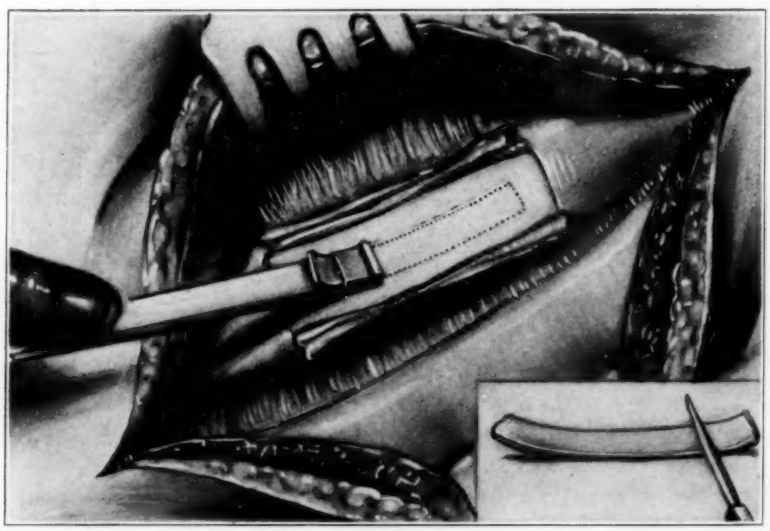

Fig. 11.—Operation of chisel for removing cartilage for transplantation between the septal mucous membrane.

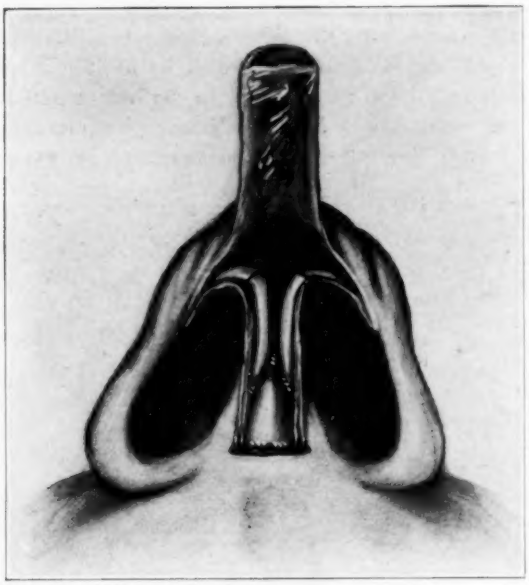

Fig. 12.—Exposure of the lateral nasal cartilages and location of incision for removing same in cases requiring their removal; also shows position of crus mediale which are separated in making septal transplant.

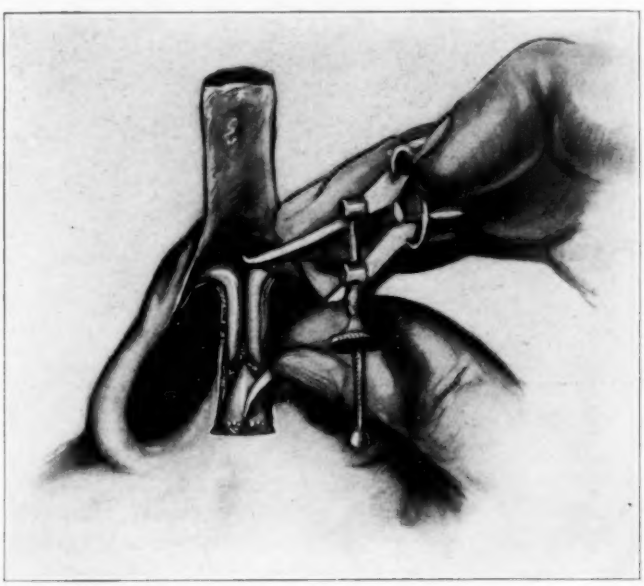

Fig. 13.—Method of measuring height of septal transplant.

In many of the cases coming to operation, there was a complete or partial absence of the septal cartilage, usually caused by operation of postoperative infection. I found that it was impossible to perform a satisfactory plastic operation in these cases unless I could devise some means by which the transplant would have the same support as offered by the normal septal

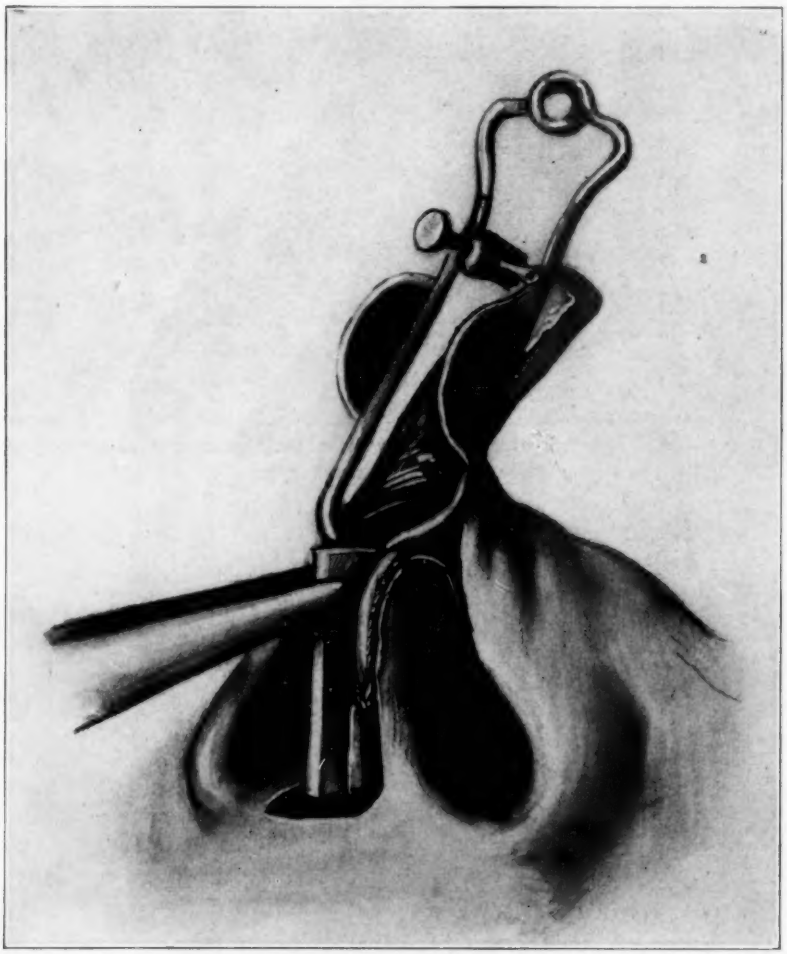

Fig. 14.—Method of inserting septal transplant.

cartilage, hence the development of the chisel *A* in figure 1. Figure 4 shows the chisel in operation and the piece of cartilage it will cut. This piece is one-half inch (1.27 cm.) wide and 2 mm. in thickness. Its length depends on the size of the exposure of the costal cartilage. By cutting the ends from this strip, a piece of cartilage is obtained which will take the place of the septal cartilage when transplanted between the septal mucous membranes.

It is the only transplant and the proper transplant to be used in the correction of drop noses.

The technic for placing this cartilage is as follows: The skin and subcutaneous tissues of the columella are injected from the base to apex with saline solution or Ringer's solution containing 5 mm. of epinephrine chloride to the ounce. A small cataract knife is forced through the columella at the base anterior to the crus mediale of the lower lateral cartilages, and the skin of the columella cut obliquely downward. Then with a fine pair of forceps and a pair of butterfly scissors, the skin of the columella is elevated to the apex of the nose fully exposing the crus mediale and the lateral surface of the lower lateral cartilage, as shown in figure (?). By knife or scissors dissection the septal cartilage is exposed, if present, or an effort is made to

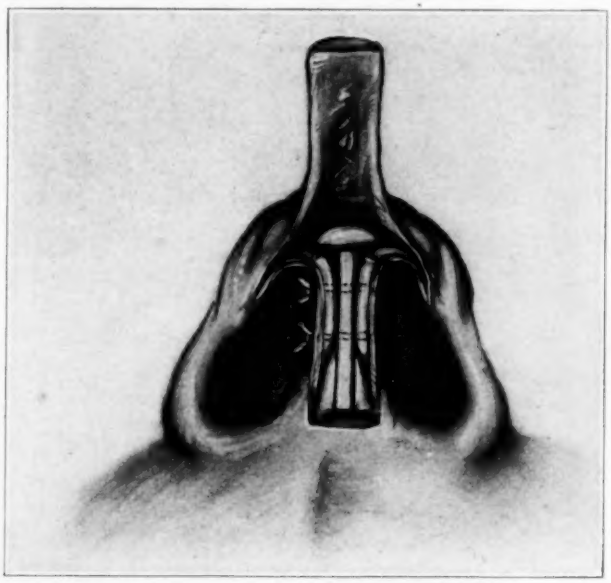

Fig. 15.—Method of sewing septal transplant with dorsal transplant in position.

find a line of cleavage between the septal mucous membranes. If a line of cleavage is found, it is a simple matter to separate the membranes down to the nasal spine and as high and as far back as desired. At this point, it is of advantage to use a long straight knife to cut the tissue along the base of the septum so that transplant may have a firm foundation on the horizontal plates of the superior maxillae. If the septum is absent and a line of cleavage cannot be found, then it is wise to inject the nasal mucous membranes with saline solution, and with a long straight knife cut an area for the reception of the transplant. A pair of calipers such as shown in the illustration is then introduced into this wound and a measurement is made of the length of the strip of cartilage to be transplanted. This measurement is made from the floor of the nose to the lower border of the nasal bones. It is well to slightly overestimate the length on the first measurement, place

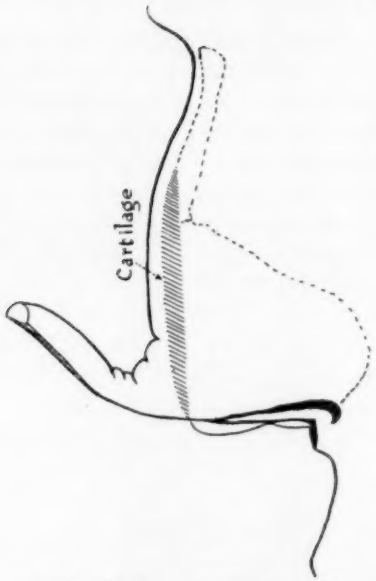

Fig. 16.—Hook nose with absence of septal cartilage following submucous operation.

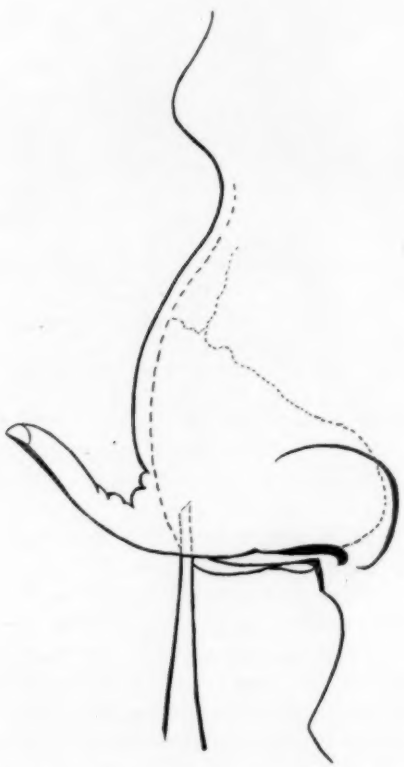

Fig. 17.—Method of removing hypertrophied nasal bones.

the strip in position and then make whatever correction one believes necessary before sewing the transplant in position. It is advantageous to make a measurement of this sort before operation in order to know how long a strip to remove from the costal cartilage. After the strip is sewed in position, it is only necessary to fasten the skin over the columella with three or four fine silk or horsehair sutures using an eye needle and an eye needle holder. Where both the dorsal and septal transplants are used, it is well to use the V shaped chisel on the under surface of the dorsal graft so as to prevent lateral sliding or twisting. The septal

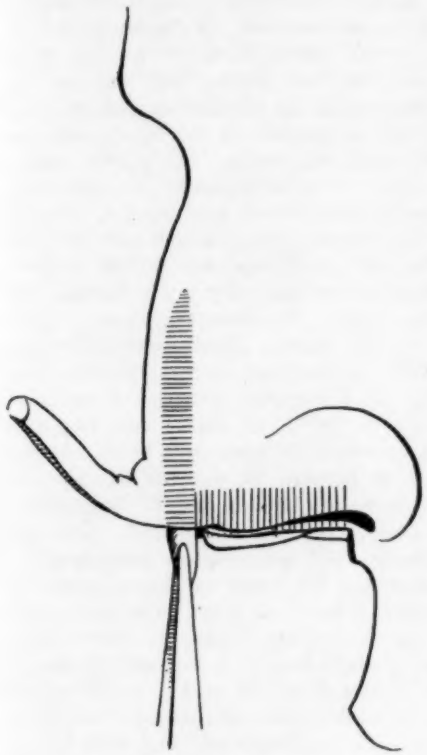

Figure 18

Figure 19

Fig. 18.—Method of placing dorsal transplant after septal transplant has been fixed.

Fig. 19.—Approximate position of the transplants after operation.

transplant may readily be placed alongside the remaining septal cartilage such as is left after a submucous operation.

I believe I may safely say that by this technic the disadvantage of the old method of removing costal cartilage is eliminated. It is simpler, more rapid, less dangerous and more accurate. This technic also makes it possible for a greater number of surgeons to perform nasal plastic surgical procedures in the simpler cases and helps to solve some of the more difficult problems of the experienced plastic surgeon.

BLIND PERITONSILLAR ABSCESS RESULTING IN DEATH FROM GENERAL PERITONITIS DISCOVERED POSTMORTEM *

FREDERICK T. HILL, M.D., WATERVILLE, ME.

The following case of blind peritonsillar abscess is of interest especially because of the finding of complications at autopsy.

A woman, aged 27, came into the hospital in January, 1928, suffering from acute tonsillitis. There was nothing of clinical significance in her family history, and she had always been well except for an operation for "appendicitis with adhesions and cystic condition of the ovaries" three years before. She stated that during the past six months she had not been feeling well and had lost 35 pounds (16 Kg.). Five days before admission to the hospital, she had developed sore throat, evidently contracted from another member of the family who had a severe peritonsillar abscess. The left tonsil was swollen and covered with a grayish exudate, and the culture showed *Streptococcus hemolyticus*. Two days later, some pus was evacuated from this tonsil, which caused improvement. On the following day, however, her condition was worse. She appeared very sick and was complaining of a sore throat. The right tonsil was only slightly reddened and not swollen; the left was of a deep red hue and very much swollen, with numerous small white patches over the surface. No definite evidence of peritonsillar infection could be ascertained. The cervical glands were tender and slightly swollen. I concluded that she had a peritonsillar abscess which had been partially evacuated two days previously, and I suspected infection of the blood.

The results of a general examination by Dr. J. O. Piper were essentially negative. Blood cultures did not show growth after forty-eight hours. During the next two days, her temperature varied between 99 and 103 F. She was obviously septic, and the only apparent focus was the left tonsil. Suspecting a deeply buried blind abscess below the tonsil, I advised its removal. This procedure was rapidly carried out under nitrous oxide and oxygen anesthesia with a small amount of ether added, and beneath the left tonsil an abscess containing a drachm or more of thick pus was opened. That evening her rectal temperature was 104.2 F. She remarked that she was feeling "fine," when she had a sudden collapse; she became pale, and her pulse, which beat at a rate of 150, became weak and thready. She responded well to stimulants, but at 1 a. m. had a chill and another collapse. She responded again to stimulants, and slept for two hours. After that she failed rapidly, and became weak and exhausted. Her pulse became irregular, and in the afternoon she complained of nausea and vomiting. About 3 p. m., she complained for the first time of severe pain in the lower part of the abdomen, and she died about 5 o'clock.

An autopsy was performed by Dr. J. P. Goodrich, a pathologist at the hospital, who reported the finding of a generalized purulent peritonitis, the viscera being bathed in bright yellow fluid which penetrated to all portions of the cavity, a recent bronchopneumonia and terminal hypostatic pneumonia.

COMMENT

This type of peritonsillar abscess burrowing into the pharyngomaxillary space is considered the most dangerous and the one most apt to result fatally. Little direct evidence of this condition was found other than persistent unilateral tonsillitis.

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* From the Otolaryngologic Service at Sisters Hospital.

There was no difficulty in opening the mouth and none of the classic signs of peritonsillar infiltration. The outstanding observation at autopsy was the pus in the peritoneal cavity and yet, symptoms referable to the abdomen were not present until just before death. Perhaps during the last six months when she reported that she did not feel well, she may have had some inflammatory pelvic process which dated from the previous pelvic operation, and this process may have been aggravated by the infection of the blood stream from the tonsil.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

PLASTIC SURGERY

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NEW YORK

Recent literature serves to indicate that in this field, as in others, the progress is in two seemingly opposite directions. The first tendency in the development of any specialty is to concentrate on the immediate problem; but it presently becomes evident that in the mastery of the local difficulty regard must be had for considerations more remote. There is, for example, some rather active criticism that in the field of dermatology there is a tendency to stereotype what has been made familiar, and that the static condition so produced can be relieved only by reference to conditions which may seem far afield. Conversely, and this is distinctly evident in relation to reconstructive surgery, once a sufficient degree of certainty has been attained in what appears at first to be a limited field, the knowledge gained and the methods employed therein are adapted to an ever widening range of applications. Thus, "The pack is the strength of the wolf and the wolf is the strength of the pack."

In this sense, attention may fittingly be directed to a study of the influence of superficial burns on concentration of the blood,[1] and another on the incidence of acid and alkali burns,[2] as observed when these irritants are in contact with the eye. Underhill's study of the effects of concentration, destructive as it is of the all essential preservation of the constancy of the composition of the blood and of the influence of burns in determining such concentration, will be found usefully suggestive, in view of the present tendency to deal with burns before, rather than after, cicatricial deformities have developed. It is never easy, if indeed it is possible, to decide how deep the injurious penetration of the tissues by a burn may be, and while, on the one hand, debridement followed by skin grafting has had the most satisfactory of results in what seemed to be hopeless cases, it is also true that in very young

1. Underhill, F. P.: Changes in Blood Concentration, with Special Reference to the Treatment of Extensive Superficial Burns, Ann. Surg. **86**:840 (Dec.) 1927.
2. Cosgrove, K. W., and Hubbard, W. B.: Acid and Alkali Burns of the Eye, Ann. Surg. **87**:89 (Jan.) 1928.

children the covering of burned areas, even if the burns are not immediately recent, may be productive of symptoms that cannot be explained with reference to the local condition. Cosgrove and Hubbard also rendered a service by demonstrating that, contrary to the accepted belief, neutralization of an acid or alkali capable of destruction is too slow to be effective, and that mechanical removal is most important. Without such removal, in an area so delicate as the eye, there will be irreparable damage, and relatively the same must be true of less sensitive tissues.

On the other side of the balance sheet, there are several interesting instances. Coughlin,[3] out of his own abundant experience with plastic methods, devised a simple but sound and effective improvement for the covering of the axilla after procedures for cancer of the breast. The standard method included a loose, or loosening, flap which became infected and caused suffering. Taking his cue from the tailor, who fits the sleeve to allow for free and unimpeded motion of the arm, he succeeded in giving the skin under the arm a snug fit, thus at once restoring function to the arm and eliminating the friction, suffering and infection that were familiar sequelae of the old methods. Colp,[4] unable to induce a skin graft to "take" over an injured knee, which had become ulcerous, resorted to periarterial sympathectomy as an aid to sterilizing, with the happy result that in five days he had a granulating surface which accepted the graft. Gillespie,[5] confronted with edematous, inflamed cyanotic areas, with exuding ulcerations, which did not yield to treatments, resorted to wide excisions, with cautery of the base, which in ten days afforded a host for small grafts from which epithelization spread over the whole area. Muller,[6] after an excision for cancer which exposed most of the lower part of the face on one side, was able to cover the defect by use of tubed pedicles so arranged as to give inner and outer surfaces, with satisfactory consistency. Two new adaptations have been found for the demonstrated ability of transplanted fascia to retain at once its tensile quality and its capacity for living. Bunnell[7] used it to replace the ruptured ligaments over the outer end of the clavicle, for want of which it was riding upward, dislocating from the joint and producing deformity. The fascia proved to be a perfect

3. Coughlin, W. T.: Plastic Reconstruction of the Axilla in the Operation for Cancers of the Breast, Surg. Gynec. Obst. **45**:523 (Oct.) 1927.

4. Colp, Ralph: Pedicle Graft of Knee Following Sympathectomy, Ann. Surg. **88**:310 (Aug.) 1928.

5. Gillespie, M. W.: Phagadaemic Ulceration of the Skin, Ann. Surg. **88**:248 (Aug.) 1928.

6. Muller, G. P.: Cover After Cancer Excision, Ann. Surg. **87**:316 (Feb.) 1928.

7. Bunnell, Sterling: Fascial Graft for Dislocation of Acromioclavicular Joint, Surg. Gynec. Obst. **46**:563 (April) 1928.

replacement. McNealy and Lichtenstein,[8] desiring to limit the arterial flow into an area in which they sought to stimulate a collateral circulation, but maintaining enough of a supply to prevent immediate death of the tissue, bound the artery with loops of fascia, the ends of which were woven through the adjacent muscles, drawn taut until the desired degree of occlusion was attained and then sutured. The tensile dependability of fascia was once more demonstrated.

The right of the patient to an improvement of appearance, if he is a victim of deformity, has passed the stage of abstract debate. If he is debarred from making a living, is shunned by his friends or is himself despondent, because of his disfigurement, he is justified in expecting from the surgeon that restoration of function shall be accompanied, if practicable, by improvement in his appearance. The fact is that function is definitely associated with the esthetic values. Loss of function conduces to disfigurement, and restoration has the opposite influence. Lee Cohen [9] emphasized some of these considerations in his description of some recent corrections of nasal disfigurements. Blair [10] carried the discussion to higher surgical altitudes in his demonstration that, in procedures for release of ankylosis of the lower jaw, it is practicable to proceed on the assumption that unless symmetry is restored (assuming it to have been disturbed) the patient has not had his due even if the jaws are enabled to function. Symmetry is the essence of art, but it became so because it was recognized that the unsymmetrical is contrary to the universal in nature, and human beings regard such departure as objectionable, to the disadvantage of those who differ. Blair showed, in this series of cases, secondarily dominated by regard for contour, possibilities in reconstructive surgery quite beyond those ordinarily ascribed to it. In another paper [11] he dealt, adequately as always, with the switching of portions of the vermilion border.

Of clinical notations may be mentioned an interesting case of Muller's,[12] in which the replacement of a lost thumb was effected by migrating a tubed flap from the abdomen, by way of the thenar eminence of the other hand, within which a transplant of bone was later inserted, with its base carried into the metacarpal. In the handling of skin flaps

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8. McNealy, R. W., and Lichtenstein, M. E.: Arterial Occlusion by Means of Autogenous Fascial Strips, Surg. Gynec. Obst. **47**:99 (July) 1928.

9. Cohen, L: Results Obtained in Corrective Rhinoplasty, M. J. & Record **127**:354 (April 4) 1928.

10. Blair, V. P.: Consideration of Contour as Well as Function in Operations for Organic Ankylosis of the Lower Jaw, Surg. Gynec. Obst. **46**:167 (Feb.) 1928.

11. Brown, J. B.: Switching of Vermilion Border Lip Flaps, Surg. Gynec. Obst. **46**:701 (May) 1928.

12. Pierce, G. W.: Reconstruction of Thumb After Total Loss, Surg. Gynec. Obst. **45**:825 (Dec.) 1927.

to cover denuded areas, Freeman [13] described the lifting up from the chest of a flap in the form of a shield, but with pedicles on both sides, near the ears, to cover areas of the chin and neck from which contractile scar had been removed. Highsmith,[14] adapting the principle familiarized by Esser of advancing the skin, after wide concentric undermining, to cover even large adjacent defects, described the gradual stretching of the skin in such cases by employing common dress hooks. Finally, one notes that Roy,[15] replacing a loss of substance in one nostril by transferring a single full thickness graft, elected to depart from the method of lining the new part. He seems to have assured himself that epithelization of the underside of the graft was achieved without such assistance.

Reference may perhaps be made to my presentation of a series of cases in which burns resulting from radiotherapy necessitated recourse to reconstructive surgery.[16] Reference is also made to the correction of certain types of facial disfigurement,[17] including nasal deformities incidental to resection of the septum when either the remaining buttress is inadequate or, from other and later causes, certain characteristic distortions are produced.

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13. Freeman, Leonard: Use of Visor Flaps from the Chest in Plastic Operations upon the Neck, Chin and Lip, Ann. Surg. **87**:364 (March) 1928.

14. Highsmith, E. D.: Covering Denuded Areas with the Surrounding Skin, Surg. Gynec. Obst. **45**:823 (Dec.) 1927.

15. Roy, J. N.: Traumatic Loss of Substance of One Nostril; Rhinoplasty with Dermo-Epidemic Graft, J. Laryng. & Otol. **43**:490 (July) 1928.

16. Sheehan, J. E.: The Dermatologist's Interest in Reconstructive Surgery, M. J. & Record **127**:326 (March 21) 1928.

17. Sheehan, J. E.: Facial Disfigurements; Functional Restoration the Chief Concern, S. Clin. N. Amer. **8**:293 (April) 1928.

Abstracts from Current Literature

Ear

MASTOIDITIS AS SEEN IN INVESTIGATIONS OF WHOLE TEMPORAL BONES AND BONE SPLINTERS. MAYER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **18**:628, 1927. (From the Proceedings of the German Otolaryngologic Society.)

In a well illustrated article, the author takes issue with some heretofore accepted ideas, and comes to the following conclusions:

Mastoiditis is initiated by an exudative inflammation originating in the tympanic cavity and progressing by continuity through the antrum, running its course almost entirely in the air-containing spaces.

As early as the fourth day, in some cases, besides the exudative reaction there may be seen resorption of bone by osteoclasts in the small bone vessel spaces, also new formation of bone as osteoid seams in both the vessel spaces and the pneumatic spaces, although the resorption and new formation are scant.

The exudative stage predominates for about a week and is then replaced by the proliferative stage, indicated by the formation of granulation tissue. During the granulation stage, there is resorption of bone. This seldom occurs by osteoclasis of the walls of the pneumatic cells, but occurs principally in the vessel spaces and usually in the newly formed vessel spaces.

Cortical perforation takes place through the outgrowth of granulation buds.

The disease process is in the region of the pneumatic spaces, progressing through the septums and cortex. Hematoplastic and fatty marrow as found in nonpneumatic mastoids is not primarily involved, but is involved when pneumatic cells are scattered through marrow spaces.

Demarcation and healing of suppuration can occur, but often there may be extension of the suppurative process into the depths of the bone, where it may be difficult to gain access for operation. In streptococcus mucosus infections, it was frequently noted that the process extended along the posterior surface of the pyramid toward the front and from there broke through the dura; this should give some guidance in operative work.

There are some cases which are largely exudative and others in which proliferation of inflammatory tissue predominates. In the first group are the stormy types, e. g., in influenza, and in the second the insidious types mostly produced by streptococcus mucosus. Between these two types are many gradations.

LEWY, Chicago.

TECHNIC OF WEAK CALORIC IRRITATION. CORNELIUS VEITS, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:542 (Feb. 28) 1928.

The clinical methods of examination of the vestibular apparatus have been furthered by simple means. With the head bent forward about 20 to 30 degrees, 10 cc. of water at a temperature of 68 F. and the same amount at a temperature of 80.6 F. are used. This is done through an ear speculum, aided by the eye, with a record syringe mounted with a needle without a sharp end. Within seven seconds, the water is injected toward the posterior upper wall of the meatus, where the drum membrane is attached. Then it is noted whether nystagmus appears, which it does not as a rule. If it occurs, namely, to the opposite side, the head is bent several degrees forward; then it stops. If the nystagmus occurs to the same side, which is extremely rare, the head is lifted a little. Exactly one minute after the beginning of douching, the head is bent backward 90 degrees. The change of position should occupy exactly two seconds. The latency until nystagmus appears is determined with the stop watch, and then the nystagmus excursions are counted. The Bartels spectacles should be worn by the patient. The latency in normal

people is about five seconds. The number of nystagmus excursions of the second degree, looking straight ahead, was about 100. The deviating reaction and the arm tonus reaction were plain. A turning sensation is usually present but is not pronounced. Normally, vertigo and vegetative symptoms are absent.

The maximum of heat or cold in irrigations with minimal quantities reaches the semicircular canal in about from one to one and one-half minutes. If a change of the position of the head takes place at this time, the effect is greater than if the position is changed before or after the greatest effect reaches the canal. Therefore, it is absolutely necessary to bring both labyrinths into the position of irritation at exactly the same time after irrigation.

Another measure of the reaction is the amplitude of the nystagmus excursions. If the amplitude of the single excursion is considerably larger, one can speak of a relative or absolute hyperirritation. After one has made many dozens of functional tests, one acquires the ability to note distinctions, so that minute differences between

Results of Tests on the Author

			Excursions
1.	10 cc.	68 F. in 7 seconds	110
2.	10 cc.	68 F. in 7 seconds syringed on the anterior lower portion of the drum membrane	70 *
3.	1 cc.	68 F. in 1½ seconds	35
4.	1 cc.	68 F. in 1½ seconds, anteriorly and downward	19
5.	1 cc.	93.2 F.	11
6.	1 cc.	93.2 F., anteriorly downward	6
7.	1 cc.	68 F. with a bent antrum cannula on the typical spot	27
8.	1 cc.	68 F. 1 cm. further outward	12
	The time of syringing is of more importance than the quantity of water and the temperature.		
9.	10 cc.	68 F. in 5½ seconds	100
10.	10 cc.	68 F. in 13 seconds	175 †
11.	5 cc.	68 F. in 7 seconds	100
12.	10 cc.	80.6 F. in 7 seconds	100
13.	10 cc.	68 F. in 3 seconds, with a large syringe	47
14.	10 cc.	68 F. in 3½ seconds, with syringe without needle	61
15.	50 cc.	68 F. in 13 seconds, with large syringe	118 ‡
16.	1 cc.	80.6 F., with the head in upright position, Kobrak phases	9
17.	1 cc.	95 F., with the head upright sometimes	4
		(feeling of warmth) sometimes no effect	0

* Weaker.
† Strong.
‡ Dizziness.

both ears or small variations from normal can be observed by virtue of the latency, frequency and amplitude. The current of water must hit the posterior upper wall of the meatus. Dohlmann, Meurmann, Frenzel and Leisse have shown that the osseous bridge of the antrum pays an important part as conductor of cold. Proper illumination of the spot and the ear speculum should be employed. An accumulation of cerumen may be detected in this way. Some humorous occurrences may be avoided. It has happened that a tumor of the cerebellum was diagnosed, whereas only cerumen was present which occluded the meatus. As an example, the author mentions some observations on himself. Douching always took place in the position of indifference (with the head bent forward from 20 to 30 degrees). After one minute, the head was placed in the maximum position. The right ear was irrigated.

Equal bilateral douching is a fine indicator of differences of irritation. The author does not insist that bilateral douching, in the position of indifference, is always without effect. Frequently he has observed that a spontaneous nystagmus increased or decreased under these conditions. Bilateral irrigation is advisable also for another reason. If a large number of irrigations is made on the same person, it is noticeable that the first irrigation gives contradicting results. This is the

result of nervous phenomena or of a sensibilization in the sense of Kobrak. By using bilateral douching first, the following unilateral irrigations will be made under similar conditions. Through consideration and exclusion of all known sources of error, it has become possible to make the functional test of the vestibular apparatus much more exact. Only through a method similar to the one described will it be possible to approach an exact and useful quantitative test.

TOPOGRAPHY AND PHYSIOLOGY OF THE CUTANEOUS SUPERFICIAL VESSELS OF THE DRUM MEMBRANE (OBSERVATIONS ON THE LIVING MAN). ERY LUESCHER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **20**:12 (June 16) 1928.

The author recently described a microscope for the ear which allows observation on the living man with a magnification of from 10 to 50 times. Vessels with a diameter of 10 microns can be seen. As a rule, an enlargement of twenty times was used; under certain circumstances, also a magnification of from 10 or 40 times. About 100 membranes were studied.

1. The topography of the superficial vessels and of the circulation of the blood on the living man can be studied with this microscope.

2. The cutis of the membrane of the drum, directly under the epithelium, contains an extensive connected meshwork of capillaries and veins, in the three dimensions, which covers the membrane in a varying arrangement and thickness. At the border, it is connected with the superficial plexus of the outer canal of the ear.

3. In spite of the various possibilities of the outflow, a certain rule exists. From the middle portion of the pars tensa, the blood goes to the umbo and then along the handle of the hammer to the upper wall of the canal over the stripe of cutis. The two outer thirds send their blood toward the periphery. The pars flaccida has an irregular current of its own. The afflux of the blood takes place in the deeper layers and is not visible normally. The kind and velocity of the blood current shows great variations in the whole and in its details, so that there does not exist a condition which can be considered to be normal.

4. The superficial net of vessels is divided into three parts, anatomically and functionally: (1) the central net of the pars tensa, (2) the peripheral net of the pars tensa and (3) the vessel net of the pars flaccida Shrapnelli.

5. The membrane of the drum is an apt object to determine the capillary pressure. It is 60 mm. of water in the average (from between 32 to 94 mm.). In some larger vessels (about 40 microns), the average is 94 mm. (from between 56 to 136 mm.). The first values are the lowest observed in man.

6. Normally, most of the vessels of the membrane are in a condition of tonic contraction, and they are closed to the blood current so that the normal blood current is confined to a few vessels, whereas this blood current is broad when dilated to its maximum. When dilated maximally, the current reaches about 20 times its normal size, and the volume velocity is from 100 to 200 times its normal velocity.

AMBERG, Detroit.

Pharynx

(From the Proceedings of the German Otolaryngologic Congress)

ANATOMIC INVESTIGATIONS OF DRY CATARRH OF THE PHARYNX. HOFER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **18**:610, 1927.

This subject has not heretofore been investigated anatomically. Dry catarrh is either primary or secondary to atrophic processes in the nose. The question is still open whether pharyngitis sicca is secondary to rhinitis sicca or due to the same cause.

Histology of atrophic disease in the nose shows: (1) metaplasia of ciliated epithelium into squamous, (2) inflammatory changes in the mucosa, (3) degenera-

tion of the mucous glands and partly of the blood vessels and (4) changes in the bone beneath the mucosa. The author reports several cases in which sections were taken from the mucosa of the mesopharynx, and shows three of these and one normal section. The changes are largely those of inflammation, with hyaline degeneration. Especially the elastic tissue seems to have degenerated, but this must be cautiously accepted as this tissue normally varies greatly in extent. Of particular note, however, is the absence of degeneration of the mucous glands as seen in the nose. The glands are found dilated and filled with secretion. In this respect the pathologic process differs from that of dry catarrh in the nose, and also in that there does not seem to be any characteristic process in the mucosa of the throat.

LEWY.

Larynx

A PECULIAR DISEASE OF THE LARYNX IN GRIP. SEIFFERT, Ztschr. f. Hals-, Nasen-u. Ohrenh. **22**:53 (June 16) 1928.

A man, suffering from dyspnea, had a thickening of both vocal and false cords and some lobulated thickenings on the posterior wall of the larynx. Syphilis, tuberculosis and a tumor could be excluded. Examination of an excised piece showed a nonspecific inflammation with edema. The patient had suffered from grip. The author assumes that the changes were caused by a muscular disease accompanied by hemorrhage into the muscles. The swelling disappeared in a few weeks, and the motility of the vocal cords returned. The author had observed another patient who suffered from an isolated disease of the left cricothyroid muscle, which was thickened and tender on pressure. Necropsy of another patient, who had succumbed to the grip, showed numerous hemorrhages into various muscles. Therefore, the author thought that in the two cases mentioned, hemorrhages had taken place into the muscles, especially because the first patient had suffered also from pain in the muscles of the body.

AMBERG, Detroit.

Nose

FREQUENCY OF BILATERAL CHRONIC INFLAMMATION OF THE MAXILLARY SINUSES. TONNDORF, Ztschr. f. Hals-, Nasen-u. Ohrenh. **22**:1 (June 16) 1928.

On the basis of 236 histories and 379 maxillary sinuses on which operation had been performed, the author arrived at the following conclusions:

The disease of the maxillary sinus is the most frequent among the chronic diseases of the accessory sinuses. It plays a similar part in the diseases of the upper respiratory tract as adenoids do in children. Persons about 20 years of age are especially afflicted. If disease of the maxillary antrum is eliminated, other slightly affected sinuses (ethmoid and frontal sinus) heal by themselves. Diseases of the frontal sinus are far less frequent than diseases of the maxillary sinus. Isolated diseases of the ethmoid or sphenoid are still less frequent. In a large percentage of cases, a bilateral disease of the maxillary sinuses is present. In an apparently unilateral disease, an exploratory irrigation of the other side is necessary in order to reach a safe conclusion.

AMBERG, Detroit.

Miscellaneous

HEALING OF THE MAXILLARY SINUS OPERATED ON ACCORDING TO LUC-CALDWELL. TONNDORF, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:54 (June 16) 1928.

Ssamoylenko and Lange have made experiments on the frontal sinuses of animals. The frontal sinuses were opened broadly from the anterior wall, and the mucous membrane and periosteum removed with sharp spoons until the osseous walls were laid bare. In order to be sure that the mucous membrane was com-

pletely destroyed, Ssamoylenko dried the field with hot air and painted it with concentrated tincture of iodine. It is true that the cavities are shallow. They disappeared through development of newly formed osseous and connective tissue. The new formation emanated from the periosteum of the outer soft tissues, but in the region of the exposed bony walls from the endosteum, namely, from that connective tissue which covers all the small interspaces between the little bone trabeculae and which possesses bone-forming qualities just as the periosteum does. Lange had expressed the idea that the maxillary antrum of human beings also, after removal of the mucous membrane, could be made smaller by such endosteal connective tissue and new formation of bone. Histologic proof has not yet been furnished. The author possesses a specimen from a patient who was operated on for a bilateral chronic suppuration of the maxillary antrum and died four weeks later from abscesses of the liver. He gives a detailed account of the histologic observations and thinks that the future healing process may be assumed with some probability. The epithelium probably will advance further into the cavity, not only from the borders of the opening made by the operation in the lower nasal meatus, until a complete covering is produced. The thick pillow of young endosteal granulation tissue will shrink when it changes into connective tissue, as is observed in the ear after a radical operation on the mastoid. Secondary operations on the maxillary antrum have shown a considerable new formation of bone which more or less obliterates the large opening. Emanating from the periosteum, pillows of connective tissue have been observed to protrude into the cavity like conical processes. All these new formations of bone and connective tissue lead to a decrease in the size of the maxillary antrum. Investigation of further stages must decide whether hereby the definite stage is reached or whether processes of involution may set in in this newly formed tissue.

AMBERG, Detroit.

Society Transactions

AMERICAN OTOLOGICAL SOCIETY

ROBERT SONNENSCHEIN, M.D., *Abstracter*

Sixty-First Annual Meeting, April 30 and May 1, 1928

MAX A. GOLDSTEIN, M.D., *President, in the Chair*

FURTHER INVESTIGATIONS OF THE SPECIAL SENSE ORGANS. DR. MAX A. GOLDSTEIN.

All of the organs of special sense—sight, hearing, taste and smell are but modifications of the sense of touch.

In the antennae of various classes of insects there is conclusive evidence that they function as olfactory as well as tactile organs, and I believe that they serve also as organs of hearing. This observation is one of the pivotal points in the physiologic and structural plan of the correlation of the sense organs.

The sense of touch seems to be most generally distributed, and from this sense the other senses appear to have been developed in most cases.

In the lower order of animals the special sense organs are not usually especially distinguishable one from the other, and in some instances the eminent scientists who have engaged in this delicate research conclude that the same nerve may be capable of carrying different sensations according to the structure of the end-organs.

In some of the lower animals, as in the jelly fish, a primitive sense organ may serve either as an organ of sight or as an organ of hearing.

Many interesting experiments have been made with insects to determine the sensitivity of the antennae, and entomologists are agreed that some of the antennal hairs serve as an organ of protection and others as an organ of touch. There is also much evidence that some serve as organs of smell, and there is a mass of significant observations to indicate that some antennae also function as rudimentary organs of hearing. In fact, it has been found that all three special sense functions may reside in the same antenna.

After a careful analysis of anatomic and physiologic detail, Dr. Goldstein concludes that this valuable research data has many practical applications in modern science and pedagogy, especially as it applies to the education of the deaf child.

Tactile impressions may be educated in the human subject to register a delicacy of perception almost equal to the capacity of appreciation of waves of sound as interpreted by the ear or waves of light as interpreted by the eye.

The ability of the totally deaf child to analyze and interpret sound waves producing speech, exclusively by the sense of touch, with as much accuracy as is possible through the usual medium of hearing has been demonstrated.

The translation of speech from waves of sound to light graphs and the accuracy with which a deaf child can be taught to translate these light graphs into speech have been demonstrated.

It is still a mooted question where the sense of touch has its physiologic limitations and where the sense of taste and the sense of smell begin; the same is true of the sense of hearing.

Dependence on the sense of touch as a pedagogic substitute for the loss of a special sense organ is by no means a new thought. It has been used successfully by special educators in the instruction of the blind for many years; it is the basis for Braille reading, for Montessori training, for various forms of sense training in modern kindergarten work, for Binet-Simon intelligence-quotient tests and for various psychologic observations.

It should be definitely emphasized that the success of these experiments and observations may be accounted for by the fact that our system of training the deaf child today includes intensive work in sense training, sound vibration, voice building, musical touch, rhythm and accent, appreciation and a careful attention to the association of ideas in teaching oral speech, including memory, form, color and other attributes that help to determine the psychology of language.

It is a significant observation that more than 30 per cent of all congenitally deaf children have some residuum of hearing. In some cases it is of so limited a degree that it cannot be practically utilized; in a large group, it remains latent because of insufficient stimulation; in all cases it should be given a reasonably long try-out, for these auditory remnants are peculiarly sensitive to stimulation and reeducation and in a large percentage of cases the perseverance and resourcefulness of the teacher will be rewarded by surprisingly good results.

We are proceeding rapidly with this substitution of one sense impression for another, and in the past decade important contributions in this field have been made.

This address was illustrated by selected lantern slides of the antennal organs of protozoa, insects, crustaceans, etc., emphasizing details of structure in the respective organs of hearing, smell, taste and touch.

A Report of the Committee on the Study of Progressive Deafness. Dr. Norval H. Pierce.

An investigation of the diseases which produce hardness of hearing may be divided into three general divisions: (1) the scientific investigation by laboratory work of the cause and prevention or cure of otosclerosis, under which as a subhead may appear clinical work; (2) the sociologic aspects, and (3) the economic aspects.

There are points of contact necessarily in all of these branches, and they should be maintained and cultivated. But what this society needs to maintain and stand for is laboratory investigations, and if encroachment of economic and sociologic factors is not resisted, Dr. Pierce believes the substance will be wasted in a diffused manner and that little of interest or importance to the society will accrue. Otosclerosis is a difficult problem and, of necessity, from its investigation will spring other problems for research, for example, investigation of the plastic inflammations.

The Carnegie fund was given for five years. At the end of that time, it may renew its allocation or it may withdraw support. In the latter case, we hope that a fund will have been accumulated, and the physicians are earnestly appealed to for the assistance in the accumulation of this fund. "I do not by any means feel that we should have an enormous fund. I believe a fund of $500,000 will be sufficient for the present if it is judiciously administered for purely scientific purposes."

The Scientific Committee, the so-called otosclerosis committee, has cooperated in this movement for the accumulation of a permanent fund, with what has been termed the Central Bureau, and administrative matters have largely been turned over to the Central Bureau with the consent of the Scientific Committee. Dr. Pierce states that we have a bright future. He is likewise of the opinion that the best thing that has been accomplished in the brief life of this movement is that the inertia of this country has been overcome concerning scientific investigation of the diseases which cause hardness of hearing and especially of otosclerosis. "It would be a great mistake to attempt to concentrate our support on any one institution. Our hope is in giving to any institution our financial support if we feel that the brains are there for its proper investigation. There is no telling where the man is going to spring up that will lead to the discovery of otosclerosis."

Dr. Pierce states that Dr. Bast has placed in his hands the investigation of a subject that, up to the present time, the former regards as incomplete, namely: the ossification centers of the labyrinthine capsule which, he believes, stand in relationship to otosclerosis. Dr. Pierce said that Dr. Crockett is as yet unprepared to report on his work regarding the administration of parathyroid in otosclerosis. Dr. Pierce believes that one cannot measure scientific investigations with a yard stick, and that while progress is slow, the committee can definitely report progress.

REPORT ON THE OTOSCLEROSIS COMMITTEE. DR. ARTHUR B. DUEL.

I am reporting for the Central Bureau which is now located at the Academy of Medicine, New York.

The New York members of the Board of Trustees have met at the bureau at regular intervals to discuss matters pertaining to the routine work of the bureau. I am indebted to Drs. Dench and McKernon for constant advice and assistance.

Circulars requesting anatomic material have been sent to twenty-five hospitals throughout the country. One hundred and eighteen hospitals have responded favorably, and to these has been sent a description of the technic for the removal and preservation of the temporal bone. We have made an arrangement with the Hospital Supply Company of New York City, whereby it furnishes the operation apparatus for $95.00.

Apropos of anatomic material for research, the New York members of the committee have been active in furnishing it. Dr. McKernon and Dr. Marion Jones at the Post-Graduate and Lying-in Hospitals have secured sixty-two temporal bones which have been sent to Drs. Crowe and Guild at Johns Hopkins Hospital, where all anatomic materal from the eastern hospitals is being sent for preparation.

The bureau, at the request of Dr. Crockett, has sent circulars to the members of the otologic and the triologic societies requesting suitable cases for parathyroid treatment. As a result, Dr. Crockett is taking, for the month of July, patients from Dr. Gorham, Lynchburg, Va.; Dr. H. D. Oggel, Maurice, Iowa; Dr. R. H. Ellis, Ottawa; Dr. J. E. MacKenty, New York City; Dr. Joseph White, Richmond, Va., and Dr. Lynch, Sherbrooke, Quebec, in addition to ten local patients. Dr. Crockett will also report on two or three of the first series of cases during the summer.

The subsidy from the Carnegie Corporation for the present fiscal year is $20,000. Under direction, by order of the Committee on Otosclerosis, $4,000 was allocated to Dr. Wilson for continuation of the work by Dr. Theodore Bast on the early development of the bony capsule of the internal ear. A complete account of this investigation will soon be ready for publication.

Two thousand dollars was allocated to Dr. Crockett for continuation of the work by Dr. Aub, at the Massachusetts General Hospital, on the treatment of otosclerosis by the use of parathyroid extract and a balanced calcium diet. A further subsidy of $1,000 has been allocated to Dr. Crockett toward the maintenance of patients at the hospital.

A subsidy of $1,200 was allocated to Dr. McKernon to continue the anatomic work in New York, and an additional sum of $531.50 for apparatus for demonstrating specimens.

To Mr. Coleman, a member of the Board of Trustees, associated with the George Williams Hooper Foundation of Medical Research, University of California, San Francisco, under Dr. K. F. Megen, $2,050 was allocated for the study of conditions of the bones in animals under change of calcium diet.

Three thousand dollars was allocated to Dr. Duel for the study of the mendelian aspect of heredity of otosclerosis, and a further $3,000 in connection with the same study, to be expended by the Eugenics Record Office of the Carnegie Institution of Washington, at Cold Spring Harbor, Long Island, under the direction of Dr. Charles B. Davenport, for the study of the family history of otosclerotic persons, together with the accompanying morphologic and physiologic traits associated with this disease. This subsidy of $3,000 has been sent to the Carnegie Institution of Washington, D. C., and will go toward traveling expenses and salary of a field worker.

Dr. Davenport has employed a field worker who is engaged in collecting statistics on about eighty family histories of otosclerotic persons, available in Dr. Edward B. Dench's office, New York.

To the Central Bureau was allocated $6,500 to its balance to carry on its activities to the end of the fiscal year (Sept. 30, 1928). The bureau pays for

the publication of the work on otosclerosis. These various allocations have overrun our appropriation of $20,000. However, there was an unexpended balance of $15,000 from last year.

This work embodying the collection, abstraction and translation of all the literature on otosclerosis has been completed. We expect the book to appear some time this fall. It will be distributed at a loss, financially, but the committee expects to be rewarded in the interest which such a résumé will excite.

In regard to the Permanent Research Fund, our gross collections, including pledges, amount to $193,241.00.

Since then, there have been additions, making a total of nearly $200,000 in this fund. In addition, largely through the activities of Dr. Dench, Mr. Edward Harkness has promised $100,000, provided the whole fund is completed by the first of next January. This means that we have $200,000 to get together in order to insure the payment of that $100,000.

As will be recollected, the whole society, as well as the Triological Society, were circularized, making this statement and asking for additional activities on the part of every member to see if it would not be possible for them to collect this $200,000. Among other methods in attempting to stimulate this activity, a circular was sent out inviting every member to underwrite some amount which they would agree to give or get. One hundred and sixteen notices were sent out, and twenty-one replies received. Not one of them offered to underwrite any amount whatever.

Dr. Pierce has told you that the work of this Central Bureau and the Scientific Committee has stimulated the activity throughout the country in the subject of otosclerosis, but I cannot see that it has stimulated sufficient activity in the raising of funds which must be available if this work is to continue. Let me urge all of you to make as much effort as possible to complete this permanent fund of $500,000. Even small amounts constantly coming in will soon swell this up to a point where we may feel that we have reached our goal. Up to the present, the activity so far as the collection of funds has been concerned discloses the fact that of this nearly $200,000, $171,500 of it has been raised in New York City. This is not a wide enough distribution of successful endeavor. There should be some more definite effort on the part of others throughout the country to swell this fund to the additional $200,000 which we need to complete our permanent fund to $500,000.

DISCUSSION

DR. EDWARD B. DENCH: I quite agree with Dr. Pierce as to the great importance of the scientific investigation of otosclerosis, and anything that I say in my few remarks must not be taken as in the least degree militating against this investigation. I thought, however, that as I am one of the older practitioners in otology and have had considerable clinical experience, that it might be interesting to go over the cases which come to one in a series of years, and determine how many of those were of otosclerosis.

Analyzing the private records of the past fifteen years, I found only 87 patients with otosclerosis in a total of 3,087 cases, this being a percentage of a little more than 2.7, with twenty-five males and sixty-two females. The percentage of patients having hereditary history was 42.5 per cent. The disease was bilateral in seventy-eight cases and unilateral in nine. The inner wall of the middle ear was distinctly pink in fifty-one cases, and when it is remembered that in some of the cases grafting had been done on a previous suppurative process, the color of the inner wall is a valuable index in doubtful cases. The upper tone limit was below 18,000 vibrations as determined with a Galton whistle in twenty-six cases, or more than 29 per cent. The lower tone limit was above 100 vibrations, being found in fifty-two cases, or more than 59 per cent. Bone conduction was increased in a little more than 50 per cent of the cases and when it was not increased this was probably due to labyrinthine involvement with possibly secondary changes in the nerve as well. When the otosclerotic process occurs only in the region of the oval window, bone conduction is elevated, but when the spongification becomes more diffuse with actual changes in the labyrinth and secondary

changes in the auditory nerve, there is usually diminution in bone conduction. One should remember that a certain number of cases have been classed as simple impairment of hearing of the middle ear regardless of whether the impairment in hearing was present either at the beginning or was dependent on a previous hyperplastic process. Some of these hypertrophic cases would undoubtedly be called otosclerosis but, on the other hand, in this series, quite a number of cases originally listed as otosclerosis in which the hearing was improved by local treatment were later classed as hypertrophic cases. The diagnosis is not easy, and I believe that it is unfair to patients with impairment of hearing to be told after a cursory examination that they are suffering from a condition which will more or less isolate them from society and render it practically impossible for them to earn their livelihood. Some of these patients do improve under local treatment, showing that a diagnostic error has been made. Would it not be better to give some of these patients the benefit of the doubt and pronounce the condition otosclerosis only after a fair effort has been made to determine whether or not they improve under local treatment?

DR. PIERCE: What percentage of these cases were checked by microscopic examination of the temporal bone?

DR. DENCH: That is just the point. This is not a report of the dead but of the living, and none of these patients has had a postmortem examination of the temporal bone. That is one point I want to make. I am confident that in a large number of instances it is impossible for me to make a positive diagnosis of otosclerosis. I have already brought out the fact that a large proportion of the cases are characterized as otosclerosis when they are not that at all. One cannot see the temporal bone until the patient is dead. Let us do what we can. Let us try to rejoice over the 90 per cent of those whose hearing may improve, instead of letting them go. Investigate the other 10 per cent and help the proportion of those who can be helped by scientific investigations. But do not turn down every patient who comes to you with a progressive impairment of hearing and call the condition otosclerosis until you have fully proved that it is and that it will not improve under treatment.

THE OSSIFICATION OF THE LABYRINTHINE CAPSULE. DR. T. H. BAST.

The labyrinthine capsule is cartilaginous up to about the sixteenth week of intra-uterine life. The first ossification centers begin in fetuses of about 120 mm. crown-rump length. The earliest center, at least in the fetuses studied, appears in the region of the beginning of the first turn of the cochlea anterioventral and medial to the round window. This bone appears to protect the organ of Corti in the oldest part of the cochlear duct. The second center guards the crista ampullaris of the posterior semicircular canal ampulla. The third center guards the cristae ampullaris of the superior and lateral canal ampullae. A minor center develops between the first and second centers, thus uniting them above the round window. The order of appearance of the succeeding centers does not seem to be uniform. Thus, in a fetus of 140 mm. center no. 5, which forms the bone of the lateral wall of the internal auditory meatus is prominent and has just united with center no. 3. In another fetus of 147 mm. an equally prominent center no. 6 lies in the medial wall of the internal meatus and is fused with another equally prominent center, no. 7, guarding the entrance of the cochlear nerve into the cochlea. These two centers are not present in the 140 mm. fetus. In the fetus of 147 mm. centers 6 and 5 are fused to form the roof of the internal auditory meatus. In the same embryo five other centers are present. One, no. 8, in the inferior medial wall of the internal meatus which later fuses with center no. 6 to complete the medial wall of the meatus and still later with center nos. 2 and 5 to form the floor of the internal auditory meatus. Another center, no. 9, occurs in the capsule of the most posterior portion of the superior canal just above the endolymphatic sac. Another prominent center, no. 10, lies in the superiormedial portion of the capsule of the first turn of the cochlea. The other two are small

and lie in the lateral and superior lateral portion of the capsule around the first turn of the cochlea. In a fetus of 190 mm., another center is well developed in the capsule over the most lateral portion of the posterior canal. The lateral part of the lateral canal capsule is the last of the canalicular capsule to ossify. In an embryo of 202 mm. there is a mass of bone in this area, but it is continuous with the rest of the ossified capsule and it is thus impossible to determine from the material at hand whether or not this arises as a separate center. The last portion to ossify is the area around the foot plate of the stapes and an area anteriomedial to the stapes surrounding Cozzolino's zone. This is accomplished by the fusion of centers 1 and 3.

Cozzolino's zone, around which bone develops late and in a poorly organized manner, is a loose connective tissue structure extending from the middle ear, anterior to the stapes, through the capsule to the perilymph labyrinth at the point of junction with the scala vestibuli. In the fetus the connective tissue of this zone is very loose and of embryonic nature very much like the perilymph tissue in young embryos. This structure together with the late ossification in this area may be of importance in relation to the otosclerotic patches which most frequently occur in this region. It may also be a possible portal of infection into the labyrinth as pointed out by Drs. Crowe and Guild.

Another interesting structure which the author has constantly found in human fetal ears is a structure which for the lack of a better term (until its function may be determined) he has called the utriculo-endolymphatic valve. The utriculo-endolymphatic valve is a highly cellular connective flap lined by columnar epithelium. It guards the utricular opening into the canalis endolymphaticus. The valve is a fold of the posterior wall of the utricle and endolymphatic canal at the point of junction. The function of this valvelike structure has not been determined. Its position would indicate that the flow of endolymph is from the endolymphatic canal to the utricle, but this is not a necessary conclusion. If the flow is in the other direction, the slow movement of the lymph may not affect this valve. On the other hand, in case of any sudden pressure disturbance this valve may prevent the outflow of endolymph from the utricle, thus maintaining a more constant pressure within the utricle and semicircular canals.

DISCUSSION

DR. J. GORDON WILSON: The model that Dr. Bast has shown of the valve of the utricle is unique. In the embryo it is clearly seen, and I have no doubt of its existence in the adult. His observations on Cozzelino's area are of interest because of the relation of this embryologic area to the common location of the otosclerotic patch. Recently I have looked over some of my slides of otosclerosis, and I would like to show two slides, not in regard to otosclerosis present but to demonstrate that the connection between the internal and middle ear, which he has referred to, still shows some trace in the adult.

Dr. Bast's work has been emphasized by the reconstructions he has made than which there is no better way of demonstrating small and obscure anatomic structure. His investigation fills in a gap in the knowledge of the labyrinthine capsule. Dr. Streeter's studies of the embryology of the ear stopped short of the ossification, and this gap in the knowledge between the cartilaginous structure and the osseous structure was, to say the least, chaotic.

A NEW TUNING FORK. DR. ROBERT SONNENSCHEIN.

Last year at New York I demonstrated a fork consisting of an alloy of magnesium. At that time, I was informed that it contained 99 per cent magnesium. The fork was made by Mr. B. E. Eisenhour of the Riverbank Laboratory, near Chicago, and I am grateful to Colonel Fabyan, who owns the estate and laboratory, for the privilege of presenting that one and others of various pitches.

This fork has been used for a year and shows no other change than in color. I now know that the composition is 95.6 per cent magnesium, 0.4 per cent manganese

and 4 per cent aluminum. When one recalls that the specific gravity of steel is about 7, aluminum 2.7 and that of magnesium 1.7, one can well understand why the forks are so light.

The Committee of the American Academy of Ophthalmology and Otolaryngology, of which I am chairman, has been endeavoring for some years to find among other requisites of good forks, a metal that was rustproof, because forks that are nickeled have the disadvantage that the nickel peels and gives adventitious sounds; and when they are not nickeled they tend to rust unless frequently oiled.

The forks have recently been perfected as low as 42 double vibrations and as high as 4,096 (c-5). It was thought at first that they would be poor for bone conduction, but some tests made recently show that for both air and bone conduction these forks are practically as good as first-class steel forks, with these exceptions: for the highest forks, the duration is shorter than with steel forks, and for the lowest tones the vibration is slightly shorter; but for the intermediate tones, the duration by both air and ear is as long as with the good steel forks.

As far as the prices are concerned, I am informed that they are practically the same as those for first-class steel forks.

Whether it will ultimately be shown that this alloy is better adapted for universal use than is the steel, I do not know, but for the past year I have used one of these forks and have found it satisfactory as compared with a steel fork of the same pitch.

The second matter that I should like to demonstrate briefly is a sound meter devised by Mr. Eisenhour and only perfected a few weeks ago.

In conclusion let me say that the pitch of the tube resonator is changed by varying its length. The needle of the sound meter will only move when a source of sound is brought to the properly adjusted resonator.

I do not know whether this appliance will be of real practical value in otologic practice or not, but it always seems to me that when anything new is devised which has a bearing on acoustics, it should be brought to the profession's notice. Furthermore, one never knows whether a scientific instrument or experiment which at first apparently has no bearing in a practical way may not give the solution or aid in the solution of problems. Therefore, I think that it is a good thing to "prove all things and hold fast to those which are good," especially in a scientific way.

DR. GOLDSTEIN: In the development of otologic science we are branching out in many directions, and within the last few years we have seen our otologic activities keenly alert to many of the associated sciences and are trying to apply these scientific principles and the research that has been done in other departments to the work in which we are engaged in otology. I think the day will come when every otologist will need as part of his fundamentals a fairly good rounding up in neurologic information.

A STUDY OF MISS HELEN KELLER'S SENSORY EQUIPMENT. DR. FREDERICK TILNEY.

Several years ago, Dr. Tilney ventured the statement that the human race had in all probability not developed more than one fifth of its potential brain power. Among other things to substantiate this statement he cites the case of Miss Keller, who to all intents and purposes with a single sense has achieved a distinguished place in American civilization. Since that time he has had the privilege of making a personal study of Miss Keller or her psychology and, more particularly, of her sensorial equipment. The problem now as then was chiefly centered on the secret underlying the wonderful intellectual development of this remarkable woman. He had in mind three scientific questions bearing on this problem: First, what light does Helen Keller throw on the actual capacities of the human brain? Second, does she reveal the validity of certain principles and methods in education which would tend to improve our present system? Third, does she demonstrate that humanity in general has not yet began to make the best use of

its brain power, and further, that some development may lie ahead of the race once the unutilized gifts of the brain are actually realized?

The first step in this study was to investigate what her sensorium really is, and the means by which she makes contact with the world. For nineteen months of her babyhood she was healthy and normal. Then she was suddenly stricken with an acute congestion of her stomach and brain. What this illness actually was no one seems to know, for all who were medically in contact with the situation have long since passed away. The illness deprived her of her sight and hearing, and the few childish words she had learned up to that time were soon forgotten, so that her illness practically left her deaf, dumb and blind. When she was 6 years old, her father was advised by Dr. Alexander Graham Bell to write to the Perkin's Institute for the blind for a competent teacher of the blind and in March, 1867, Miss Anne Sullivan, who is now Mrs. John Macy, came to Helen Keller in her seventh year.

The truly marvellous results of her education, which Miss Keller has now made a matter of history, were due to the ingenuity and wisdom of her great teacher, Mrs. Macy. Under her tutelage, Helen was prepared for and entered Radcliffe College in 1900, just two years behind the average time for entering such a school. She graduated with honors, and since that time her writings, addresses and efforts in behalf of those afflicted as she has been are among the notable achievements of modern history.

Shut off from the world as Miss Keller has been on account of her defects, she has thus become the subject of the greatest interest, particularly in order to understand the avenues by which she has acquired her remarkable culture and understanding of life. This study makes it almost imperative that we first have some simple conception of those avenues through which we ourselves have gained and do gain our knowledge of the world. The nervous system makes contact with the body environment by means of the body sense, and with the general outside environment by means of the contact sense. The body sense severally is subdivided, consisting of a skeletal sense, that is, a mechanism by means of which we gain all necessary information from the muscles, joints and bones, and also from a group of organs, the semicircular canals especially in relation to special orientation and balancing sense. These collectively have been called by Sherrington the proprioceptors. In addition to these components, there is in the body a sense quality which is derived from the viscera, which gives information to the nervous system from this source. Thus contact sense, by means of which the nervous system touches the rest of the world outside the body, is divisible into still other groups such as touch, hearing, sight, taste and smell. Three of these are immediate in their general character, as they depend on immediate contact of stimulus of some surface of the body. Two of them, sight and hearing, are intermediate because they depend on wave conduction, either of light or of sound to reach what is known as distant receptors.

Dr. Tilney is engaged in research regarding another sense, namely, that which guides the homing pigeon and the migratory bird; the sense, for that matter, which serves in the return of all animals leaving a point of departure and making their way back to their burrow or established home. Even now it is possible to add an eighth sense, the hurt sense, to the list. This is fundamentally protective, while all the other senses are fundamentally directing or guiding. It pervades all types of sensibilities and brings an essential protective or defensive mechanism into play which guards against extremes of stimulation, that is, extremes of heat, cold, overexertion or overflexion, too much light, too much sound or of too much in the way of olfactory or taste stimulation.

By means of charts the sense of development was diagrammatically shown. Helen Keller's skeletal and visceral senses are normal. Of the other senses, the olfactory was little if any better in perceiving and discriminating these stimuli than that of the average normal adult. Concerning the sense of sight, a simple statement covers this part of the sensorium, for both retinas are absent, and Miss Keller has no perception of light, object or motion. Her hearing is, of course, entirely absent. With reference to her sense of touch, a few tests were made.

Miss Keller's two point discrimination was not any better than that of the normal average adult. Her best two point discrimination is on the tip of the tongue where she has the ability to recognize two points 0.5 mm. apart. She is able to take a needle, put its eye on the tip of her tongue, identify it in this way, and then holding the needle and thread close together, with patient application, she can actually thread the needle. In the matter of weight discrimination, she is not able to distinguish anything less than 1,000 mg. In focal vibrations measured by means of the pallesthesiometer she corresponds almost absolutely to the normal.

In the various examinations it seems fair to assume that this study has not demonstrated any superiority in Helen Keller's primary perceptive organisms. Whatever she has done in the way of gaining supremacy over the average individual must not, therefore, be attributed to her receptor system. It has all been brought about by the use she has made of her sensory impulses once inside her head, that is, actually in her brain.

DISCUSSION

DR. GOLDSTEIN: This paper of Dr. Tilney's strikes home so deeply because of my own close association and long years of study with the deaf child. I, too, know Helen Keller. I know her fine mind, her excellent scholarship and her imaginative disposition. I taught Hellen the two-step on the roof garden of the Copley-Plaza in Boston, at the time of the International Otological Congress years ago. There was a time when Helen's voice would carry a distance of only five or six feet; after a conference with Professor White of the Boston Conservatory of Music, the resonance and volume were improved so that she could be readily heard across a fair sized auditorium.

I think, with Dr. Tilney, that Helen's outstanding development in the face of her tremendous handicap is due largely to the quality of her mind, her intensive training and the versatile and competent guidance of her teacher, Mrs. Macy. She went through Radcliffe, with Mrs. Macy as her constant companion and mentor and passed her examination just as seriously and successful as any girl who could hear normally.

I would like to add one thought that might be of interest. After the functional examination of biologically congenitally deaf children, these are divided into two groups: (*a*) those profoundly deaf and without any evidence whatever of hearing; (*b*) those who have a remnant of hearing as shown either by audiometer test, amplified human voice or other form of sound or its amplification.

These children are assigned to daily ten-minute stimulation by sound vibration, either of instrument or the voice. In many instances, these pupils show evidence of improvement in hearing capacity. I have convinced myself, after comparative tests taken at six months' intervals, that this improvement in hearing capacity is not physiologic in character, but is, perhaps, a mental or educational development of rather surprising degree. Even where this marked improvement in hearing is in evidence, the audiometer shows no concurrent improvement in this group.

In the other group, there is not only an improvement in the mental or educational hearing quality and understanding, but also of the physiologic hearing capacity as well.

DR. L. H. TAYLOR: I saw Helen Keller when she was 6 years old. She was brought before the meeting of the American Medical Association in St. Louis in 1896. I remember we were asked to look at this little girl who was blind and deaf. Dr. Savage asked us to examine her. The ophthalmologic and otologic sections at that time had not been separated. Had we known that we had before us a human being in the person of this little girl who was to develop into the most marvelous woman of the age, perhaps we would have used our brains in a little different way. The speaker said that it is doubtful whether we use our brains even a small fraction of the way we could. I cite this as an illustration of how we miss our opportunities, and then think of the wonderful development in our knowledge nowadays in the training of deaf and blind children. It was a wonderful development in this case.

DR. F. L. JACK: May I tell Dr. Tilney something about Helen Keller's sense of rhythm? Your reference to it made me think of the occasion at the meeting in Boston when I had the rare opportunity of dancing with her. Her sense of rhythm was as good as anyone's with whom I have ever danced. I thought you might be interested in this phase of it. You spoke also about her probably having an absence of the sense of direction. I started this dance the usual way—I was going to make it my dance; but I soon found that it was much easier to go her way, and we hit it off nicely.

RADICAL MASTOID OPERATIONS PERFORMED DURING THE LAST FIVE YEARS AT THE MASSACHUSETTS EYE AND EAR INFIRMARY. DR. LEON E. WHITE.

This work was undertaken in an effort to determine the value of various tests before operation and the relative merits of different methods of performing the operation and epidermatizing the radical cavity. The author wished to observe the effects of the operation on hearing, freedom from discharge and intracranial complications. By checkups it was hoped to learn something of the utimate value of the radical mastoid and in what way, if any, our methods of handling these patients might be improved, not only while they were in the hospital but more especially after their discharge to the outpatient department.

With three exceptions, all patients have been followed for from one to three years after the operation. The majority returned for a final inspection of their radical cavities and hearing tests. This follow-up work is of the utmost importance among hospital cases, but it was found to have been neglected, at least at the Massachusetts Eye and Ear Infirmary, for many patients have gone out with beautifully epidermatized cavities only to return in a year or two with an ear filled with broken down débris and granulations. In private practice with cooperative patients, these radical cavities are easily kept dry and clean for the patient's lifetime. Why can we not, with better and more systematic cooperation of our Social Service Department, obtain almost equally satisfactory results with patients seen in the clinic?

A study was made of fifty-four radical mastoid operations which were performed at the Massachusetts Eye and Ear Infirmary. Various tests and examinations were tabulated and previous treatment and operations noted. A third of the patients had been previously operated on once or more for mastoiditis, and about half of them had had their tonsils and adenoids removed. The nose was considered normal in 75 per cent of these cases. Half of the patients had cholesteatoma, and most of them had been under treatment in the outpatient department for several years. The fundi and visual fields were practically normal in all the cases. The Koerner flap was the only one used.

Primary skin grafts were usually employed. Of the two methods, crepe de lile and paraffin basket, the former was given the preference in the ratio of 27:11. The end-results were about the same irrespective of the method of epidermatization.

Hearing was improved in five cases, unchanged in six and worse in seventeen. It appeared to fail for several months after the operation, probably due to cicatricial tissue about the stapes. The average stay in the hospital was thirty-three days.

In thirty-three of these fifty-four cases complications were not noted. Six showed slight postaural infection. Severe infection in both the postaural wound and the radical cavity occurred in four cases, and it was necessary to remove the sinuses and the packing. There were four postoperative facial paralyses. One was due to trauma and came on directly after the operation and cleared up within nine months. In the second and third cases it followed the secondary skin grafts and cleared up within a month. In the fourth it came on nine days after operation and lasted about three weeks. Four patients had preoperative facial paralyses. One followed an attempted radical operation by an outside specialist for tuberculous disease of the mastoid a year before admission and was probably permanent. Severe vertigo for a week after the operation was noted in one case. One patient developed marked atresia of the external canal. One had several severe hemor-

rhages from the edge of the Koerner flap and because quite exsanguinated. This hemorrhage usually came on during the night and was so severe that at one time it was feared that the bone over the lateral sinus had become eroded and the sinus wall neurotic. Cauterizing the edge of the skin flap eventually controlled this unusual complication. One patient developed erysipelas and another chicken-pox. One had meningism so severely that at first it was thought that he had real meningitis. The temperature was elevated and the spinal fluid slightly cloudy, with 1,500 cells but no organisms. When the sutures and packing were removed, the patient quieted down. Another patient had convulsions, bronchopneumonia and erysipelas associated with a stiff neck and was desperately ill. A blood transfusion greatly benefited him, and he ultimately made an excellent recovery. Sequestrums comprising the cochlea and promontory were removed from two of the patients with preoperative facial paralysis.

An attempt was made to check up on all these cases one or more years after the operation, and fairly satisfactory reports were obtained for forty-seven. The radical cavity was dry in twenty-five and slightly moist in fourteen. Twelve cavities contained granulations and offensive material. Two of the latter operations were considered failures, and both patients needed another radical operation. The others should have become dry on receiving appropriate treatment, as all had reached this condition through neglect. The fourteen moist ears had, on the whole, good cavities but were moist either from neglect or from some acute flareup in the nasopharynx. Four patients were readmitted several weeks after leaving the hospital for infection about the auricle or in the radical cavity. The infection in two of these subsided under local treatment. The third patient who was taken home against advice had, when readmitted, a red and swollen auricle, but this subsided under treatment after the removal of a large bunch of granulation tissue which had blocked the canal and interfered with the drainage and ventilation of the radical cavity. The fourth patient was readmitted on another service two months after his discharge and he died three or four weeks later from basillar meningitis.

The follow-up work clearly demonstrated that these patients do not receive proper attention after their discharge from the hospital. Practically all who returned regularly to the outpatient department had good cavities and dry ears. Many returned only when the discharge from the radical cavities became offensive. Some had to be readmitted for the removal of granulations and débris under a general anesthetic. Others had red cavities, largely denuded of epithelium and containing islands of granulations, but recovered under appropriate treatment in the outpatient department.

With systematic follow-up work on the part of the Social Service, these post-operative complications should be avoided. The treatment of these patients in the hospital was satisfactory, while the after-care was, on the whole, unsatisfactory. After it is recognized that this is so, appropriate steps to correct it should at once be taken.

Since the completion of this paper and its perusal by Miss Amy Smith, the head of the Social Service Department of the Massachusetts Eye and Ear Infirmary, the following method of handling patients on whom radical mastoid operation had been performed has been instituted:

1. The outpatient social service worker of the ear department gets in touch with all the present patients on whom radical mastoid operations have been performed while they are in the hospital; she thus becomes acquainted with them and gains their confidence.

When these patients are discharged, she puts them on her follow-up list. The outpatient records are marked so that when the patients return, they are referred to her, she takes them to one of the senior physicians in the clinic and after they have been treated, notes the date on which they should return. If the patient does not report on time a note is sent, and if this brings no response the patient receives a visit from the social service worker. By this follow-up method it is hoped that permanent contact with the patient will be maintained. Twice a year,

or oftener if necessary, these patients are brought to the outpatient department for inspection of their radical cavities.

Lists are being made of the patients on whom radical mastoid operations were previously performed and notices sent to them to report to the outpatient department, so that it is hoped that contact will soon be made with most of these old cases and a semiannual checkup established.

OBSERVATIONS ON FIVE HUNDRED AND SIXTY MASTOID OPERATIONS. J. CLARENCE KEELER.

When a series of cases of mastoid disease in which operation was performed before 1917 is compared with those seen since the war, it will be noticed that in the later series diagnosis was reached more promptly, operation was undertaken earlier, fewer complications occurred and fewer patients died. These observations are certainly encouraging, but a careful review of the work done personally since return from military service, now comprising 560 cases in which operation was performed, makes the author feel that still greater improvement is urgently needed. "We are doing better, but the best is still far from us."

Most otologic patients are first seen by general practitioners, and these men should be still more prompt in opening the ear drum and noting the condition of the ears in all diseases in which aural complications have any chance of arising.

Too often a patient is allowed to become septic and almost moribund because the attending physician feels confident that the mastoid is not involved, and awaits the "classic signs" of redness, swelling, tenderness over the mastoid and drooping of the superior posterior wall, which textbooks and teachers of otology have always emphasized. Usually, by the time these "classic signs" are in evidence, the patient is either beyond help, or nature has evacuated the pus unaided and by its extravasation through a cortical erosion, has provided an external outlet and prevented the otherwise inevitable cranial involvement.

X-ray examination and bacteriologic reports will aid in making the diagnosis before the classic signs appear. To obtain an uncontaminated specimen of the discharge, immediately after myringotomy the suction cup should be applied to the external auditory meatus, or a small cotton-tipped applicator applied to the opening just made in the eardrum. Discharge within the tympanic cavity is not always from the tympanic end of the eustachian tube. It may be the result of infection of the cellular structure in the immediate vicinity of the promontory, or from the cochlea itself. The circumscribed purulent labyrinthitis, in which infection is confined to the promontory with fistulous openings into the tympanic cavity, is commonly found in these cases. The promontory is eventually exfoliated in the form of a sequestrum. This is characteristic, especially of tuberculous infection.

In roentgenographic examination, the author had the assistance of Dr. Willis F. Manges, roentgenologist to the Jefferson Hospital, Philadelphia, where most of the patients here considered were seen. When such skilled aid is available, not only will the x-ray tell the type and size of mastoid with which one has to deal, it can also show if the cell structure is still normal or has undergone pathologic changes and whether atrophy, destruction or sclerosis of the bone is present; it is also of great service in warning one beforehand of anatomic variations in the position of the lateral sinus.

A review of the histories of the patients included in the present series shows impressively how long many of these had given active evidence of pathologic conditions of the ear before any proper steps were taken to remedy them. One man, aged 42, had had a discharge from the ear since the age of 3; he had been treated practically all his life, but had never been advised to have an operation until he came to us. All sorts of procedures are carried out on adjacent organs after which, the patient is assured, the ear will "clear up of itself." Tonsillectomy, straightening the nasal septum, turbinectomy and opening of the sinuses are all recommended as means of stopping a discharge from the ear patently dependent on tympanic and mastoid pathologic changes. Frequently, proper examination of the ear is never made; the family physician, or even an industrial nurse, will prescribe

"drops" or irrigations, which only serve to macerate tissues already diseased, and thus render conditions worse than if nothing whatever had been done.

Many of these 580 patients, however, had had previous operations on the mastoid. One had had five, and a number of others told of four and three. This leads to but one conclusion; many of those who are now attempting to do mastoid work are not competent, having neither the judgment nor the skill to decide what surgical procedure is required and to carry it out properly. Too frequently, when the operation has been properly performed, its effects have been nullified by post-operative neglect. Children, especially, are often left without proper attention during the necessarily slow process of dermatization of a radical mastoid cavity. Cooperation between otologist and general practitioner should be fostered by everyone concerned, so that better "end-results" will be attained in mastoid work of all kinds.

In the presence of cholesteatoma the author is convinced that the radical mastoid operation is the only procedure which can cope with the situation. While he does not advocate total disregard of any possibility of restoring auditory function, we feel justified in saying that the patient's ability to hear with the ear operated on is certainly no more jeopardized by the performance of the radical operation than it is by the halfway measures so often employed in the hope of conserving the hearing.

In regard to cholesteatoma, the fact that many of the patients were young, often infants, yet had tympanic cavity and antrum, with as much of the mastoid process as had developed packed with cholesteatoma, points strongly toward some other origin for these collections than impaction of desquamated epithelium. He is inclined to believe that they have their origin in a definitely diseased condition of the underlying cellular structure. The accumulation of data certainly seems to give confirmation to this conception of its etiology. Another surprising observation on the pathologic condition in these cases is the frequency with which necrotic exposure of the dura and lateral sinus was encountered without any infection of these structures. Extradural abscess is by no means a frequent complication, appearing in less than 5/10 of 1 per cent of all cases, and sinus thrombosis is still less frequent. Facial paralysis also occurred far less often than before the war. Even when paralysis was evident at first it is usually cleared up in the course of a few weeks or months. His theory is that inflammation in the sheath or outside pressure on the nerve may produce this, and that when conditions have been changed, by operation, the sheath and the fibers it contains gradually return to normal.

Sixteen cases were complicated by meningitis, fourteen patients dying soon after operation. Most of these were moribund before the intervention was undertaken as a last resort. The conditions revealed at these operations demonstrated only too clearly how much delay and ignorance had contributed to the fatal outcome. With perhaps two or three exceptions, everyone who died had presented symptoms of aural disease for a long time. The author believes that, in general, mastoiditis is a preventable disease, dependent on ignorance, carelessness and delay.

The clot dressing has not proved satisfactory. Applications of radium have helped very much in some cases in which healing was slow or did not take place at all.

As is the rule in any series made up largely of material from hospitals, efforts to find out the condition of patients operated on some time ago were not successful. Less than 20 per cent of those who wrote said that they still had discharge from the ear, but all those examined showed fully dermatized cavities, the discharge, if present being due to moisture acting on a collection of wax and desquamated epithelium which needed cleaning out. Some reluctantly admitted that they had disobeyed orders and gone swimming. Hearing was surprisingly good in every one personally examined. The author is convinced that improvement in hearing is the rule rather than the exception. One factor not often considered is the great improvement in the patient's general health after the focus of infection, which has existed in the mastoid often for years, is finally cleared away.

Every otologist should do everything in his power to keep his patients under continuous surveillance as the dentist and ophthalmologist do theirs. It is only in this way that their procedures can be checked up and improved, and inefficient methods eliminated. Immediate after-care should be kept in skilled hands as far as possible, and the surgeon should not be satisfied to dismiss the patient from his mind after a dressing or two. The long period which even the mastoid most favorably operated on requires for healing makes this peculiarly difficult, yet the need of it is none the less urgent. If each patient were carefully observed until he was completely healed and seen at frequent intervals thereafter, there would be far fewer "reoperations," and the odium which all too frequently attaches to "mastoid surgery" would be forever dispelled.

DISCUSSION

DR. JACK: I have to repeat what has been said by all the speakers — follow-up treatment. This is where the good results in cases are often lost, and if otologists had a social service connected with their private office to take care of private patients, they would get ultimately better results.

In regard to the blood clot dressing, I think that it was first mentioned in a paper read at a meeting in 1906, giving results in a series of sixty cases of so-called blood clot dressing, which is a misnomer.

These cases were taken from records of the aural department of the Massachusetts Charitable Eye and Ear Infirmary for five years. Ten of the cases were my own, and the remainder were reported by different members of the staff. The majority of these patients were suffering from acute suppurative inflammation of the middle ear and acute mastoiditis.

Uncomplicated healing was obtained in only four of the sixty cases — after intervals of seventeen days, fourteen days, eight days and twenty-two days. Almost every one of the cavities broke down — some without much inflammatory reactions, but most of them with a great deal.

DR. RANDALL: It has been sufficiently claimed, perhaps, that invariably cholesteatoma occurs in the chronic case of suppuration; but I feel that, in my forty-odd years of reiterating it, that I nor anybody else, have emphasized it enough for it certainly is the case that there is noticeable formation of cholesteatoma in the great majority of chronic suppuration cases. Therefore, some of the points that have been made with regard to clearing out the cholesteatoma and scraping away its matrix should be emphasized and perhaps expanded.

As for blood clot dressings, I have had a number of good results but have been using it rarely in the chronic cases.

DR. GOLDSTEIN: I should like to ask Dr. White whether he uses a follow-up system at intervals of six months, in regard to functional tests of hearing with the audiometer, in order to check up and determine improvements in hearing. This would be a valuable means of collecting data on a large scale to develop the ideas of preventive medicine as far as it applies to deafness and to determine whether the hearing status remains in statu quo, whether it is deteriorating or whether it is improving.

DR. L. E. WHITE: That is an important point. I have found that the degree of hearing that is obtained when the patient leaves the hospital was not the same as that obtained a year later. I think that, as a rule, these statistics are taken from tests on the day the patient is discharged and not one or two years after discharge.

I was able to get data on more than half of my patients — a year or more after they left the hospital — and I found that the hearing did not remain as it was when they were discharged and that it was apt to grow worse. So, unless a check-up is made some time after the patient has been discharged from the hospital, the data are not accurate.

If the cavities are dry and have only an accumulation of débris, the patients return once in six months. Of course, if the cavities are moist, the patients come

in until the ear is dry. Six months is the longest time for them to stay away. If there is any question of their needing treatment more frequently they come back in two months or in three months or whatever the time may be. An attempt is made to perform occasional tests of hearing in these cases as time goes on, simply as a question of scientific study.

I think Dr. Jack emphasized the importance of following these cases. That was the principal object of this paper — to emphasize the treatment after these patients got out of the hospital. It is all very well to call these patients cured, but do they stay cured? That is the important thing.

I feel that the paper demonstrates the necessity of more thorough follow-up work, and in talking with the social service workers at the infirmary and impressing on them the importance of this subject, I was able to get them to cooperate with the follow-up work.

Speaking of the blood clot from a point of history, when I was a house officer with Dr. Clarence J. Blake in 1893, he wrote a paper on blood clot dressings and read it at Montreal. We had twenty-five or thirty patients who we followed at that time, and in few of them was the condition satisfactory.

As to facial paralysis, of which Dr. Dench spoke, I had the honor of being Dr. A. O. Green's house officer, and he was very thorough in doing mastoid work. He was one of the pioneers. As a rule, facial paralysis occurred in his cases. That was the rule and not the exception. I know that I had probably a half dozen during my service, and I did not perform very many mastoid operations in those days. All the patients recovered. I think that one should not be too much alarmed when one sees facial paralysis following an operation. The patients practically always get well, unless, of course, one has been too extreme.

Dr. Keeler: I wish to stress the beneficial therapeutic effect of radium in the postoperative treatment for radical mastoid operations. Radium may be used to stimulate cell proliferation as well as to destroy exuberant granulations. To illustrate, a radical mastoid operation had been performed several years ago. Several years later, the patient came to the clinic suffering from a large fibroid polyp, which extended beyond the external auditory meatus, preventing the free escape of pus. The mastoid was reopened; apparently, the polyp was attached to the hypotympanum in which there is no osseous structure remaining. Being in the immediate vicinity of the jugular bulb and the carotid artery, I deemed it unwise to explore further in this blind cavity with the curet without previous consent of the patient for ligation in event of emergency. Shortly after this operation, granulations rapidly developed in the same location. The patient's recovery was slow. Radium was applied, followed by almost spontaneous healing. Two years have elapsed; the cavity is completely dermatized, and her general health has greatly improved.

A child whose mastoid cells, even those extending into the petrous, were destroyed and the cavity filled with cholesteatoma, was making a slow postoperative recovery. There was no evidence of dermatization of the cavity, and a slight discharge persisted. Radium produced such a stimulating effect that the cavity soon became healed, and for two years there has been no discharge.

The Telephone and the Ear. Dr. J. A. White.

This paper is presented in order to elicit a discussion on the probability or possibility of the telephone doing permanent damage to the organ of hearing. A woman, picking up the receiver of the telephone to answer a call, immediately dropped it and said that "she had been shocked by a very loud noise, which injured her ear, and resulted in a disturbance of her equilibrium with physical pain and general disability." Dr. White could find no evidence of deafness, nystagmus or ataxia, and regarded the condition as a hysterical manifestation. He later sent out a questionnaire to a number of otologists with reference to their experience in cases of injury to the organ of hearing due to the use of the telephone. The replies were not very conclusive regarding impairment of the aural mechanism from

telephone shock. According to Singer, "a trauma or shock from whatever cause produces what is called commotio auris interna, but this will result if it affects the perilymph, whereas if both perilymph and endolymph, not only deafness but vertigo and nystagmus will be present." This could only occur from a general trauma or a violent shock as the membranous labyrinth floats free in the perilymph and therefore is protected against any damage except by a highly violent shock. Experiments made during the war of the effect on the internal ear of high degree explosions indicated that tremendous violence was necessary to produce concussion of the internal ear. When deafness did occur, it was thought to be due to hemorrhage into the labrynth or paralysis of the organ of Corti.

Dr. White concluded that this patient's trouble with reference to her ear and nervous system was in the same class as railway spine, which usually gets well when damages are collected.

1. Damage to the ear could possibly result from using the telephone during an electric storm or from an electric shock due to a short circuit from a high tension wire, but judging by reports of such cases, the damage would only be temporary. However, with the modern safeguards of fuses on each telephone circuit that would be blown by a very light charge of electricity, this possibility is practically impossible. 2. Deafness, nausea, tinnitus and vertigo have occasionally been caused by so-called acoustic shock or loud noises sometimes occurring during the use of the telephone, but such quickly disappear. 3. Persons reporting these effects were usually found to be neurasthenic. 4. The author was unable to find a single report of damage to the static labyrinth or typical nystagmus, vertigo, etc., resulting in involvement of the semicircular canals. 5. The probability of harm to the ear from constant use of the telephone among employees of telephone companies is only to be considered with reference to those employees who already had some otologic trouble or were of neurotic tendencies. 6. Therefore, only people free from ear trouble of any kind and in a normal physical condition should be employed by telephone companies.

DICUSSION

DR. DENCH: I can conceive that the excessive use of the telephone might produce neurasthenia, but I do not understand how it could produce nystagmus unless it had caused some injury to the static labyrinth or the auditory nerve or to the nucleus of the vestibular nerve. Observers are sometimes lax in their observations of nystagmus. I understand from Dr. White that this patient had no nystagmus when he first examined her, but that it developed later—several weeks afterward. I would like to ask Dr. White if he saw it himself.

DR. WHITE: I never saw her but once.

DR. DENCH: Perhaps we are not careful enough in determining the presence of nystagmus. As I make my hospital rounds, it is not at all uncommon for one of the house officers to say to me, "We have a patient in the ward with such-and-such a condition, and the patient has nystagmus in both directions." When this statement is made to me I am very certain that we are dealing with a physiologic nystagmus. If the patient has a large nose and is made to look either to the right or to the left sufficiently far, so that the nose entirely obstructs the vision from one eye, this patient will have a rapid nystagmus in the direction to which he looks for the reason that the vision is entirely cut off, and he is only looking at the examining finger with one eye. One must always be certain that a true binocular vision is present before one can say that a patient has nystagmus in one or the other direction. If the examining finger is held 18 or 20 inches from the eye, it will be almost impossible for the nose to shut out the vision from the eye opposite to which the patient is looking. I have seen this physiologic nystagmus so often due to errors in examination that I feel this is possibly the cause of the conflicting reports in Dr. White's case.

DR. RANDALL: A matter which Lowenburg of Paris has laid a good deal of stress on for many years, but which I think has not been as widely accepted as it

ought to be, is the rather curious observation that women have in about two thirds of the cases a more defective ear on the right side and men more defective on the left; and as the left ear is the one which is habitually used in telephoning by operators, who are mostly women, the matter of defective hearing on the left side might have some distinct meaning. It is a matter which I cited many years ago in a paper before the New York Academy of Medicine, and I think that it deserves a little more study.

DR. JACK: I am very much confused. I thought that possibly Dr. White would make the solution for the difficulty I find myself in because I have recently seen three cases of telephone shock or electric shock or whatever it may be—I do not know and nobody apparently knows what happens. So little is known about it that I think eventually something will be found which points to the fact that something has really occurred. It is true that cases are occurring all the time, and the telephone company is trying to discover the remedy for it and undoubtedly they will. It may be a force of air driving the stapes in perhaps and causing difficulty in that way, and the injury that results is determined probably by the amount of force. I believe that there is a change—a pathologic condition or a traumatic lesion.

I have three patients in mind, one a painter and another a business man and another the wife of a physician. These people were strong, healthy and phlegmatic, and their stories are identical. They all made long distance calls. They went to the booth, put the receiver to their ears, and in the process they received a blow (some describe it as a blow and some as a shock) which knocked them over. They were dizzy. When they regained their composure, to a certain degree, they found that they had marked tinnitus in their ear, and shortly after that their hearing was materially impaired.

I have not the slightest suspicion but that the physician's wife was telling a straight story. She is a fine musician, one of our best pianists. She had a little trouble in one ear. This happened, unfortunately, in her good ear, as those things always do. She was unable to play the piano on account of discords, and life was made miserable for her. That has lasted now, with little change, if any, for a year and a half. In the other cases, I think, the deafness was what I call permanent. Now, I have always thought that there was a great deal of hysteria and nervous manifestation in some of these cases I have heard about. These three cases have occurred fairly recently, and it is hard for me to believe that they are manifestations of anything neurotic.

MR. J. B. KELLY, Bell Telephone Laboratories, New York City: Dr. White has spoken about the hearing sensitivity and perceptive ability of constant users of the telephone such as operators. Some of our observations at the Bell Telephone Laboratories may be of interest.

In connection with research work to rate the performance of various telephone systems, a group of people is occupied a large part of each working day in listening to speech transmitted over different telephone systems set up for study. Their ability to perceive and interpret speech improves with practice. Not only are they able, as time goes on, to understand a greater percentage of speech if it is transmitted in a somewhat distorted manner, but there is also an improvement noted in their ability to interpret speech of weak intensity. However, the sensitivity of the ears of these people as measured at the time of employment and as measured from time to time over a period of years does not show any change.

For years, the Bell Telephone Laboratories have carried on studies in audition and in methods of measuring hearing acuity; a considerable number of articles have been published giving the results of this work. A number of these have appeared in otologic journals. The following might be mentioned as of interest in connection with the subject under discussion: Fowler and Wegel: Audiometric Methods and their Applications (Tr. Am. Laryngol., Rhinol. & Otol. Soc., 1922); Fletcher: Physical Measurements of Audition and their Bearing on the Theory of Hearing (J. Franklin Institute, September, 1928); Fletcher: New Methods and

Apparatus for Testing the Acuity of Hearing (Laryngoscope **35**:501 [July] 1925); Fowler and Fletcher: Three Million Deafened School Children, Their Detection and Treatment (J. A. M. A. **87**:1877 [Dec. 4] 1926); Fletcher: Demonstration of the Principles of Talking and Hearing (Am. Otol. Rhinol. & Laryngol. **36**: 1 [March] 1927).

I take it from Dr. White's remarks that he feels that possibly some of the data on the physical makeup of the telephone system would be useful in further investigations. If his paper leads to further study of the matter, I am sure that the telephone companies, the Bell system, who are keenly interested in the problem, would be glad to furnish information and to cooperate as far as possible.

THE EMBRYOLOGY AND NEUROHISTOLOGY OF SPHENOPALATINE GANGLION CONNECTIONS; OTALGIA. DR. RALPH A. FENTON and DR. OLOF LARSELL.

Study of otalgia of sphenopalatine origin, handicapped by difficulty of obtaining proper material, has been disappointing to Sluder, Muller, Terracol, Bertein and others. The anatomic pathway for these sensory impulses, erroneously ascribed to sympathetic fibers incapable of such function, was partially worked out in Ramsay Hunt's clinical studies of herpes oticus, 1907-1915, though he was unable to secure actual anatomic proofs.

Larsell and Fenton, accepting the sphenopalatine as a sympathetic ganglion with characteristic multipolar cells, point out its origin in comparative anatomy along the course of the palatine branch of the primitive seventh nerve. They also emphasize the fact that lower forms show numerous physiologically different sets of nerve fibers, readily traceable by size, myelin sheathing, etc., in the seventh, ninth and tenth cranial nerve trunks, and to a lesser degree in the fifth. Thus the fifth and seventh are much alike in lower vertebrates, while in the mammals reapportionment of function leaves the fifth largely sensory and the seventh largely motor.

Although they point out that the sphenopalatine ganglion cells, sympathetic in character, receive small preganglionic fibers through the great superficial petrosal nerve, the authors demonstrate numerous large medullated fibers of the sensory type which run through the sphenopalatine and great superficial petrosal to reach cells in the geniculate ganglion; these sensory fibers come from palatal and nasal distribution.

Confirming Ramsay Hunt's clinical studies and Rhinehart's work on the mouse, Larsell and Fenton have found in the human fetus a small facial branch distributed through the auricular branch of the vagus to the posterior part of the auditory meatus and tympanic membrane, and to the cranial surface of the concha and skin over the mastoid. Its fibers rise from cells in the geniculate ganglion.

The great superficial petrosal nerve may be considered a mixed trunk, consisting of a white ramus communicans plus the palatine seventh. The geniculate ganglion, into which the cutaneous auricular branches of Rhinehart pass, is a sensory ganglion containing unipolar cells of the usual craniospinal type. Large myelinated fibers from the palatine distribution are traced by the authors through the sphenopalatine ganglion without interruption into the great superficial petrosal nerve and then to cells of the geniculate ganglion.

Larsell and Fenton thus established the conditions needed elsewhere in the body for reference of pain from a visceral region to a body surface. Irritation in the sphenopalatine region stimulates the palatine seventh fibers through the great superficial petrosal to cells in the geniculate ganglion; these cells are directly related to contiguous cells from the fibers of the cutaneous branch of the facial, described by Rhinehart, and transfer the pain impulse to the auricular and mastoid region supplied by this nerve.

Further work on the deep petrosal sensory tracts, carotid plexus, vagus and glossopharyngeal connections is in progress and may throw some light on asthma and on allergic and anginal phenomena.

DISCUSSION

DR. WILSON: Dr. Fenton gave a quotation from Hinton in his classic work on pain, and I would quote another passage from the same author. "Every pain has its distinct and pregnant significance if we will carefully search for it." This paper is such a search into an extremely complex area of nerve distribution. Pain is a subjective phenomenon and as such has not recommended itself to laboratory workers, who prefer objective phenomena. While clinicians have always recognized its importance in diagnosis, the greater emphasis now laid to this significance has come from the investigations of Mackenzie and Head. But if such observations are to be of value, not only must our deductions rest on painstaking observations, but our speculations of its causation must coincide with such anatomic and physiologic data as are available.

Pain, as Dr. Fenton has said, can come from two sources: (1) cutaneous nerves; (2) deep different nerves (the so-called visceral pain, from muscles, joints, tendons and fascia) which can be produced after the cutaneous nerves are destroyed. These two travel by separate paths, and it may be with other sensations as far as the first synapse where a sorting out takes place; thereafter, all pain sensations travel along a common path to the central nervous system. Dr. Larsell and Dr. Fenton's work is a search for the peripheral anatomic basis for pain in the head, referred it may be some distance from a presumed source, in which a clear anatomic connection is not apparent.

There are two distinct teachings in regard to causation of referred pain: (1) that confined to segmental areas and (2) that over diffused areas, nonsegmental. The first has a neurologic basis but does not seem to cover all cases. The other, in the meantime, is based largely on clinical observation. The fifth nerve is the chief sensory nerve of the head. Its pathways are not always easily traced, since they interlace with fibers from other sensory and sympathetic ganglions and nerves. It is acknowledged that the gasserian and geniculate ganglions are sensory and that the sphenopalatine is sympathetic. From what Professor Larsell and Dr. Fenton have shown, the tracing of the communicating and interlacing fibers of the sphenopalatine, with the geniculate, the carotid plexus, and the vagus is extremely complex and difficult. To understand their communications one with the other, it was right and proper that they should begin with the lower vertebrates, where one expects to find a simpler pattern. Here the fifth and seventh are equally motor and sensory. With phylogenetic development, functional readjustments take place and in man the motor of the fifth has almost disappeared and also the sensory from the seventh. The third division of the fifth has still a motor trunk to the muscles of mastication, and the seventh has still the geniculate.

What especially puzzles the clinician is that type of referred pain, remote from the diseased area or from the peripheral distribution of any of the nerves passing near the lesion. It is necessary to remember that to have referred pain there must be an anatomic pathway. Pain cannot be explained by any jumping of sensations to another nerve either near or remote from it; intercommunication must take place at synapses in close proximity.

I would limit myself in this discussion to the relation of the geniculate ganglion of the seventh nerve to cutaneous sensation. Several years ago, I published some observations on the cutaneous nerve and the membrana tympani and external canal in which I showed that they come chiefly from the auriculotemporal of the fifth and to a less extent from the Arnold branch of the vagus. This is now accepted. In that paper I discussed the question of afferent fibers connected with the facial. The cutaneous facial supply is still in doubt. It has not been possible, by cutting the facial nerve in the facial canal and then studying alterations in the geniculate ganglion, to arrive at any conclusion, for it is acknowledged that deep afferent fibers come from the geniculate. Dr. Ramsay Hunt devoted careful observation to the cutaneous facial supply and made interesting clinical observations on possible cutaneous afferent nerves to the region around the ear, based on disease of the geniculate. The most interesting of his observations have been in cases of herpes oticus associated with paresis of the facial, sometimes associated with disturbance

of the acoustic nerve. The difficulty of making this a basis for anatomic distribution appears to me to be that usually such lesions involve more than one adjacent ganglion. Such evidence is very suggestive but not conclusive, as it is difficult to be sure that one is dealing with a clearcut case of geniculate involvement or whether the disturbance has spread to an adjacent ganglion. Dr. Fenton's observations will help if he should find confirmation for some of the observations of Dr. Larsell and himself. Many years ago, when studying the nerve supply to the external ear, I attempted to settle this by destruction of the geniculate and by studying degenerative cutaneous fibers, but the results were inconsistent and were never published. When this matter is settled, it may clear many of those associated pains between nasal diseases and cutaneous pain in remote regions of the head. Any relation of Arnold's nerve to the fifth would furnish us with a remote relationship. Arnold's nerve is a small nerve from the vagus, with a definite local distribution to the tip of the mastoid and behind the auricle. It appears to be extremely active functionally. It receives from two sources constantly—one from the ninth of the glossopharyngeal and one from the tenth or vagus. Often, apparently, Arnold's nerve gets a branch from the facial. If this is constant, it may help to explain referred pain to the tip of the mastoid from the nasal cavity, though other explanations are possible.

DR. RANDALL: It seems curious that while much attention has been paid to the localization of the optic nerves, chiasm and tract of the fibers of the various segments of the retina of the two eyes, and data most valuable to neurology and cerebral surgery obtained, there has been so little similar study that Dr. Wilson directs attention to the acoustic nerve. It is of special value in the Bárány tests and in the exploration of the subtentorial tract which has previously been almost inaccessible, and thus much knowledge in fields hitherto unchartered has been gained. But the mere occurrence of nerve deafness for high tones as one of the earliest symptoms of tumors of the pontile angle has been cited almost alone in the latter connection. The mechanical structure, however, as well as the physiologic aspect of the matter is obvious. The nerve fibers from the small apex to the cochlea, where paradoxically are housed the largest elements of Corti's organ, pass axially brainward to be clothed ad seriatim by the fibers from the lower tones; so that the ensheathing peripheral filaments which emerge into the internal auditory meatus are those from the basal cochlear turn. Therefore, pressure or other injury on the eighth nerve by a tumor mass means that these fibers are naturally the first to suffer and to fail to convey excitation from the lower cochlear turn. Whether the Helmhoz theory is acceptable or not, clinical and pathologic evidence shows that this is the part of the apparatus for the reception of the highest tones. Dysfunction may, like the pressure, be narrowly limited, yet penetrate deeply enough into the nerve trunk to involve fibers from the upper turns so as to give rise to isolated losses of various parts of the scale; this may be marked by extensive defects or limited sparing of fibers and retention of a separate island of hearing so often observed in practice.

Until discrepant facts are adduced or a better anatomic explanation is forthcoming, it may be well to assume that nerve deafness for the high tones is evidence of limited pressure on the acoustic nerve in or about the internal auditory canal. It ought to be comparatively easy in experimentation to exclude limited groups of these fibers and their function, and, by the resulting degeneration of their neurons and the corresponding Corti apparatus, to furnish more convincing evidence than Witmaack's proof of experiment when he tried to subject certain cochlear areas to the degenerative effect of exhausting vibrations of chosen frequency.

DR. FENTON: I wish that Dr. Larsell might be here to discuss the comparative anatomy, which is out of my field. I simply propounded clinical questions to Dr. Larsell which he answered supremely well; we shall try to oblige Dr. Wilson by finding the connections he wants.

This study has had nothing to do with the fifth nerve, the tympanic distribution of which was definitely settled by Dr. Gordon Wilson eighteen years ago. We have limited our investigation strictly to that form of otalgia in the auricular and

mastoid region which can be relieved by cocainization of the area of the sphenopalatine ganglion. This group of sensory fibers from the sphenopalatine we have traced into relation with the sensory fibers of the seventh nerve in the geniculate ganglion, fulfilling the law which governs referred pain via the spinal ganglion elsewhere in the body. We hope to work out the vagus connections during subsequent study.

The question of involvement of these sensory fibers in superficial, though severe adhesive inflammation at the point of their emergence from the medulla is raised in a recent report by Bar of Nice. His patient suffered not only from a classic herpes zoster oticus, but also from shoulder, and sternomastoid and glossohyoid, and herpetic eruptions in the tongue, palate, pharynx and larynx, with transitory anditory disturbances, facial palsy and permanent paralysis of the corresponding vocal cord.

It seems to me that Bar's deducations are wrong. I would rather be disposed to hold with Dr. Wilson that this was a matter of virus affecting a great many ganglionic sectors, but Bar felt that it was perhaps an involvement along the chain of fibers as they emerged from the side of the bulb. This would line up with the view of Professor Larsell, that there is a possibility (which he himself does not embrace) that these things may eventually be figured out as occurring in the central nervous system and not the periphery.

Practically, our impetus to the study came from an otalgic girl whose mastoid had twice been opened fruitlessly by an ill-advised colleague. The otalgia disappeared completely after wide opening of a sphenoidal empyema invisible to the x-ray. It did not show at all in the nose until we had taken off the turbinate and had entered the sphenoid. Formerly a neurotic invalid, she now has become a useful member of society.

If further investigation will assist us to an understanding of other sensory pathways, which seem to convey through the carotid plexus to the glossopharyngeal and vagus innervation, information of vascular changes in the nose and ear of which the clinician is not locally aware, we may be able to contribute something further to an explanation of asthma, of certain types of vertigo, of laryngeal and pharyngeal hyperthesias, and similar phenomena at the menopause.

INFLAMMATION OF THE EAR IN MENINGITIS, BASED ON THE STUDY OF THE PATHOLOGIC EXAMINATION IN SEVENTY-FIVE CASES. DR. SAMUEL J. CROWE and DR. STACY R. GUILD.

From the laboratory's collection of sections of the temporal bone from cases in which the principal cause of death was some form of acute meningitis, there were some selected illustrative of the variations in degree of involvement of several of the so-called "portals of entry." About forty-five lantern slides of photomicrographs of parts of the internal and middle ears of these were projected and informally described.

One series showed material from persons with purulent meningitis without involvement of any modiolar structures, with perivascular inflammation only and with both perineural and perivascular reactions. Attention was called to the importance of the large perivascular spaces about the modiolar vessels. The variation from the normal, to complete necrosis of the soft tissues of the cochlear aqueduct, was shown in another series of slides. Infection of the endolymphatic duct and sac was observed only in material from persons with purulent labyrinthitis. Invasion from the middle ear through the membrane of the round window was illustrated by a series showing the normal, several degree of inflammation and cases of complete perforation with labyrinthitis. Infection passing through the stapediovestibular articulation with and without necrotic changes in the ligaments was shown. The tissues of the fissura ante fenestram (Cozzolino's zone) contained numerous inflammatory cells along its whole extent from the middle ear to the vestibule on both sides in an infant, aged 6 months, indicating that this route may be not only a potential but an actual portal of entry for infections. Since the entire length of the fissure was included in each of several vertical sections, there could be no question of continuity.

DISCUSSION

DR. GUILD: There is one conclusion I might draw here. Dr. Crowe and I have felt as we have studied this series that each case is a law unto itself. There are patients with severe meningitis without involvement of the labyrinth through any portal, and others with most serious involvement and without any apparent difference otherwise.

In the rest of the sections that were not projected because of lack of time, there was a series of pictures showing perforations of the membrane of the round window —some from the middle ear side, and some apparently from the labyrinth out. There was one of the normal cochlear aqueduct and a series of slides showing how the meningitis infection had involved the cochlea through the aqueduct, and other cases showing just as severe meningitis with a normal cochlear aqueduct.

The saccus and ductus endolymphaticus route is a potential port of entry for infections. I might summarize by stating that the endolymphatic duct and sac are normal in every case except those showing purulent labyrinthitis. We have only found pus and infection of the endolymphatic duct when it has come from the labyrinth side down. It does not seem to come up by invasion of the saccus through the meninges as far as we can tell from our material.

The thing that has impressed me most in this, and that Dr. Crowe has brought out, is the severity of the perivascular involvement in the modiolus in the cases of meningitis. There are many cases which do not show any involvement of the nerves or ganglion and practically normal-looking perineural regions but with a severe inflammatory reaction around the vessels of the modiolus. Then again, as Dr. Crowe pointed out, there is no involvement. I think that every one of you as clinicians have seen cases in which the labyrinth did and others in which it did not become involved. Our anatomic pathologic study confirms such clinical observations. The cases differ.

DR. GOLDSTEIN: When I visited the Otological Laboratory of Johns Hopkins last winter, I was impressed by the amount of valuable material that had been collected in the comparatively short time that the laboratory has been in operation, and I feel partly responsible for this presentation, as I made the suggestion to bring up for consideration the study of meningitis, based on the large number of case records and laboratory observations at disposal.

One of the salient points emphasized in the presentation today was the variation of the portals of entry to the meningeal infection. Here is a question that has puzzled me for a long time: The brain stem is contained in a comparatively small area. Where there is a diffuse meningitis or one of more circumscribed character, why is it that the auditory nerve is attacked with such great frequency and the other cranial nerves escape involvement? Statistically, we recognize the fact that the proportion of deafness following meningitis is a tremendously preponderant one as compared with the other cranial nerves that may be involved in an inflammatory or suppurative meningeal focus. There must be some definite intrinsic anatomic cause for this peculiar state of pathologic end-result. Is there some difference in the structure or in the resistance of the auditory nerve as compared to the other cranial nerves, or is there some unusual exposure of the auditory nerve in its superficial origin which makes it more vulnerable than other cranial nerves, or is there some other predilection of the meningeal process as it involves the brain stem that attacks the auditory nerve more viciously than the other cranial nerves?

I cannot overlook this opportunity to call attention to the fact that in the Otological Research Laboratory at Johns Hopkins, with its vast clinical and laboratory material and the excellent system with which this material is gathered and recorded, opportunities are placed at the disposal of otologic science for valuable research and study.

DR. RANDALL: One point of interest Dr. Goldstein mentioned is that it is quite manifest that the eighth nerve is involved; and exceeding it or commonly associated with it in the frequency of its involvement is that of the sixth nerve,

which is the most slender and by far the longest exposed of the cranial nerves. Accordingly, I hoped Dr. Crowe would also point out the coincidental involvement of the facial nerve because of a dehiscence often observed in the facial canal above the oval window in young children; and the transmission which I have seen in clinical cases of the inflammation along the facial nerve.

DR. SMITH: I should like to ask Dr. Crowe whether in any of these cases he has had sudden deaths, in which a patient is apparently well, and in a few hours is dead from meningitis, which is proved by autopsy. I could relate several of such cases if I had the time. I would also like to ask how many of these cases are acute—in other words, how many result from acute otitis and how many from the chronic type, and if he has had any recoveries. I would also like to know the principal points that he has depended on for the diagnosis of meningitis and whether he practices repeated lumbar puncture for both a diagnostic and therapeutic measure, or does he purposely avoid the procedure.

DR. LESTER M. HUBBY: I would like to ask what relation the fissura anterior has to the fissure which was described by Dr. Bast yesterday?

SEVERAL VOICES: It is the same thing.

DR. CROWE: In answer to Dr. Smith, I can only say that it is largely due to the influence of Dr. Osler and others, who were responsible for organizing the Johns Hopkins Hospital, that we now have such a large percentage of autopsies. The temporal bones were taken out at every autopsy and given to the Otological Research Laboratory. Many of these patients we never see during life. This is true of most of the cases of meningitis I showed today. The slides were shown to illustrate the pathologic condition of meningitis and labyrinthitis, and not as examples of otitic meningitis.

Each one of these case reports is fully worked up by the service on which the patient is admitted, with a description of the lumbar punctures, fluid changes, elevation of temperature, etc. There is a complete hospital history and diagnostic study in each case of meningitis shown, but all of this group were on the medical or pediatric service.

SOUND-PROOF ROOMS. DR. DANA W. DRURY.

In constructing a sound-proof room, the size, shape and contents of the room must be considered. The partitions are best made of thick, homogeneous material which has the advantage over the thin partition of greater rigidity and inertia. It must be considered that absorption of sounds by any material is due to the porosity, compressibility and elasticity of its structure. An air space impedes the passage of sound. Further, the deeper in the ground the room can be built, the more easily it is rendered sound proof. The William E. Nickerson Laboratory was built in cognizance of these principles, a room within a room, in order to secure two independent walls for each partition. Against the plaster of the original wall, two layers of Housline separated by one of no. 22 gage sheet iron were installed. A 4-inch terra cotta wall, plastered and thickly painted, was then built on a base independent of the former. The ceiling was treated with Johns Manville Acoustical Felt covered with muslin membrane which was furred down about 1 inch below the surface of the felt. The two window sashes were removed and replaced in cement, the joints furred with weather stripping. The second wall, 9 inches interior to the original, had two windows similarly placed. The floor is mosaic laid in cement, on top of which is a heavy battleship linoleum, cemented. Above this there rests a 1 inch felt, covered with a heavy sail cloth and thickly painted. All this is above the original floor with an intermediate air space. The room is closed with a heavy ice box door set into a cushioned furring of felt. The ventilation is supplied by Stewart high and low pass filters.

In constructing a partition, the degree of sound proofness desired should qualify the construction, as complete proofing demands expensive materials. Ordinary partitions interlined with diaphragms of absorbing material such as felt, felt paper,

mineral wool, slag, asbestos and cork are usually adequate. An air space between double walls has been found more effective than a filled space, although a felt filling approaches air in efficiency.

As a sample of the value of a sound proof room constructed on the foregoing principles, a series of audiometer studies in air and bone conduction without noise and in the presence of a tone measured as to both its pitch and intensity were carried out. Ten normal subjects were used. The Western Electric audiometer and bone conduction were used, with a special tone generator which could be made, after calibration, to produce sounds of measured pitches and intensities. It was found that the personal factor of concentration was such that satisfactory readings could not be made if either observer or observed were fatigued. Dissimilarity of ears caused more errors than faults in the observer's judgment, but the ordinary noises of the day materially affected the aural acuity curve. The observation that pitch more than intensity produces loss of acuity in the normal ear warrants, the author believes, the conclusion that the ear does distinguish the quality of a note as the eye recognizes color in an object. These observations embody a preliminary report.

DISCUSSION

MR. R. L. WEGEL: For anyone who has experienced the difficulties of making measurements of normal or nearly normal ears, the problem of finding a quiet enough place is apparent. I wish to congratulate Dr. Drury on his patience in studying his experimental conditions as far as the effect of noise is concerned, before going on with a detailed program of measurements of hearing. When he feels satisfied that he has a "sound-proof" booth, I think we may all have considerable confidence in the results of his measurements.

Dr. Drury discussed the details of construction of a sound-proof booth, the principles of which are, of course, fairly well understood qualitatively, but it is ordinarily a difficult matter to design and construct such a booth to satisfy any specific requirements. Sound penetrates into a booth through the walls from the air outside and also through actual conduction in the solid material such as floors and walls with which the booth is in contact. The latter is ordinarily, I think, the favored path.

The loss by conduction from the outside air through a substantially solid wall such as a thick one of brick or concrete is a matter usually of 70 or 80 sensation units, while conduction of disturbances originating in the supports of such a booth is a matter of about half this figure. Ordinarily, such solid walls are impracticable on account of the space required, the weight and the expense of construction. The usual procedure in such a case is to build the walls of the booth of alternate layers of light and heavy material. The principle of this construction is that sound in penetrating suffers repeated reflection losses, and is thus reduced in appreciable amounts. One difficulty encountered in this light type of construction is that the walls or parts of the wall may be somewhat resonant at different frequencies and thus propagate sound of those frequencies with unusual facility. These booths must also be supported on the floor of a containing room in such a way that floor vibrations are not easily communicated to the walls of the booth. This requires a special type of insulation for the booth to rest on.

It is interesting to know the results which Dr. Drury has obtained by the use of acoustic filters for his ventilating system. The former methods of keeping sound from passing through a ventilating system was to have a sufficiently long duct lined with a sound absorbing material such as felt. The filter structures undoubtedly reduce the size of such a system materially and also provide satisfactory sound insulation.

The noise apparatus used by Dr. Drury in his test consists of tones containing a fundamental frequency and a large quantity of harmonics delivered to the ear through a loud speaker. In such a case, the loud speaker ordinarily produces a considerable distortion and the amount of this distortion is rather difficult to measure. It seems to me, therefore, that the measurement of the input current to

his loud speaker is not closely correlated to the sound output. It would seem to me offhand that the best test Dr. Drury has of the characteristics of his noise is that which he found by measurement of the masking of tones coming from his audiometer receiver.

DR. N. H. PIERCE, Chicago: I would like to ask the speaker what, in his opinion, is the best way to ventilate sound-proof rooms not in communication directly with the outside.

DR. E. P. FOWLER: We built a sound-proof room in the Manhattan Eye, Ear and Throat Hospital. It occupies one half of the old testing room, and it cost within a little of $1,000. It was built by the Johns-Manville Co., and consists of a series of layers of felt and a reflecting material of iron sheets, as advocated by the speaker. They put on two or three layers of felt, which I insisted on, this being one more than they were going to put on, and we ventilate that room by baffle plates of felt. However, it is a hot place to work in, and you have to go out and get some fresh air once in a while. It has been a satisfactory testing room for people of normal hearing and, as Mr. Wegel pointed out, for the testing of deaf people you don't need a sound-proof room, but merely a quiet place.

However, no room is absolutely sound proof and loud noises, especially the crying of infants near the room, or grating of steel tools on concrete floor will come through the walls of a so-called sound-proof room.

DR. T. J. HARRIS: I wish I could entirely agree with what Dr. Fowler has said. I think I have been having more recent experience with that room than he has. In the first place, it is extremely hot; in the second place, it is not sound proof. Only last week, as I think I was telling some of the gentlemen, I was using the audiometer there, and the patient said, "Can't you have those babies taken out of that room. We can't hear what is being done." They were not in that room but they were in the clinic room nearby.

DR. GOLDSTEIN: I should like to submit a sketch of a homemade, sound-proof booth that I am now using in conjunction with audiometer tests.

This booth is 5 by 6 feet; the framework is made of 2 by 5 lumber; the walls are tacked to both sides of the frame, leaving a two inch air space between. The wall covering is Celotex, a form of compressed fiber and pulp building material. I found that heavy chenille portières are no longer fashionable, so I went to a second hand shop and brought a lot of these hangings; they are hung loosely and gathered on the inside walls of the cabinet, and they also cover the ceiling. On the floor is a flat, compact mattress, covered by a rug of the dimenstions of the cabinet. The front of the cabinet is fitted with two heavy portières suspended from rings and extending from ceiling to floor. An electric light in the center of the ceiling supplies the illumination. The cabinet looks like an Anna Eva Fay seance booth; it cost all of $35; is as sound proof as the expensive ones which have been constructed and described, and affords no more ventilation than the one used at the Manhattan Eye and Ear Hospital.

DR. DRURY: In answer to Dr. Pierce, our room is ventilated by the Stewart high pass and low pass filters. The low pass filter is a hollow tube about 4 inches in diameter, inside of which is placed felt, and inside of that an aluminum disk, jutting out in the lumen of the main copper disk about an inch. These are separated at intervals in the tube by felt. The high pass filter is a hollow tube without the aluminum disk but with perforations through the copper tube.

It was suggested to me that in diseases of the ear one does not take into consideration sufficiently the reduction of the sound in hospitals. Is it possible or feasible or wise to treat persons with diseases of the ear, lesions of the brain, etc., with less noise in the immediate vicinity?

In answer to Dr. Goldstein, I will say that the Johns-Manville people have suggested the feasibility of making a small booth, similar to a telephone booth, of a thin absbestos wood. It is called transite, with an asbestos cover in the way of a blanket.

REPORT OF THE COMMITTEE OF THE NATIONAL RESEARCH COUNCIL ON THE RESULTS OF INVESTIGATION IN THE INSTITUTES FOR THE DEAF IN THE UNITED STATES REGARDING THE CAUSES OF IMPAIRED HEARING. DR. CHARLES W. RICHARDSON.

After giving a synopsis of the history of the inception of this survey and the organization of the committee Dr. Richardson outlined the general methods of procedure. He gave the geographic units selected for the purposes of the investigation, there being one group in each of the cities of New York, Chicago and Philadelphia arranged for this purpose. A chart was designed covering the details of heredity and consanguinity, the age at which an acquired deafness developed, the relation of the disease of the upper respiratory tract, the condition causing the deafness, and the connection between the condition of the nose or throat and that of the infection of the ear, the results of the functional testing, etc.

The committee decided to close this work as of Dec. 31, 1927, at which time the investigation made in nineteen schools covered 3,734 pupils.

STATISTICAL STUDIES OF THE CHILDREN IN THE PUBLIC SCHOOLS FOR THE DEAF. DR. GEORGE E. SHAMBAUGH.

The studies were made and the work done under the supervision of Dr. Charles W. Richardson, Chairman of the Committee on the Physical Survey of Schools for the Deaf. All together, 3,120 children were examined. The various problems studied and the results obtained were shown in a series of charts. Dr. Shambaugh and his co-workers first studied the etiology of acquired deafness, such as scarlet fever and syphilis, the vestibular responses in these various conditions, and the relation of tonsils and adenoids to lesions of the middle ear in these children. The so-called congenitially deaf, 1,928 in all, were divided into two groups; those in which the condition was definitely congenital, and those in which there was some element of doubt. There were two groups of the 1,192 children with acquired deafness; those in whom the onset of the trouble had been associated with otitis media, and those in which there had been no infection. With the Schwabach test, they found bone conduction absent in 2,040, shortened in 795, practically normal in 94 and prolonged in 50. In the last group the presence of the prolonged bone conduction must in part be due to the difficulty in differentiating between the jarring tactile sensation and the actual sound perception. The Rinne test was also carefully studied in these cases, and found positive in 456 cases, negative in 270 and no air conduction at all in 2,505 cases. The patients were carefully examined with the audiometer in order to detect remnants of hearing with this apparatus which were negative to other functional tests. Because of the importance of the question of speech, the cases were divided into four groups; those in which deafness was total to all tests, those in which there were remnants with the audiometer, and those in which there was total deafness with the audiometer, but remnants of hearing with other tests.

DISCUSSION

DR. FOWLER: I would like to ask one or two questions about the examination of the children. Dr. Shambaugh said that bone conduction was increased, or normal, or diminished. I would like to know at what frequencies it was done. It seems to me here was a remarkable opportunity to have obtained the relative losses by bone conduction, at maybe two or three points spread over the frequency range so that one might correlate it with the losses by air conduction when that could be tested. If one uses the 126 and even the 256 fork in children, it is often difficult to tell whether one had any bone conduction loss because they may only feel it, but say they hear it, apparently for the normal time. The higher forks, the 512 and 1024, are much more accurate for both children and adults, and if one takes air and bone conduction up to the 2048, and better even to the 4000 frequency, one then begins to get some information about the way sounds act in the labyrinth.

Dr. Shambaugh has graphically described why one would expect to get bone conduction remnants even in these very deaf children because of the fact that the ossicles were ankylosed and therefore the low sounds by air could not get in. Now, if this is correct reasoning, the higher sounds by both air and bone conduction should have entered, and one might have discovered some interesting data.

DR. T. J. HARRIS: As Dr. Shambaugh said in regard to this work, just one table alone could consume our time profitably, I would say, for two sessions, a whole day. As a result of this extensive study, has Dr. Shambaugh reached any conclusions about methods of examination, the various bits of apparatus, and especially, I should like to ask him what his conclusions are in regard to the value of time spent using the audiometer?

DR. SONNENSCHEIN: Dr. Fowler has just spoken about the facts that when air conduction is diminished due to fixation of the stapes that hearing by bone conduction is good and that it would be desirable to test the high tones by bone conduction. I think it is well to remember that with tuning forks it is almost impossible to test high tones by bone conduction. But with the monochord one not only can test the highest tones, but they are better heard by bone conduction than by air. Kalaehne, the German physicist, I believe, stated that he thought the reason that the hearing by bone conduction for the very highest tones could be tested with the monochord and not with the tuning fork was the fact that the amplitude of vibration of the stem is only about one one-hundredth that of the prongs of the tuning fork. You will recall that the prongs make transverse excursions of great amplitude but of slight intensity; the stem makes longitudinal vibrations of small amplitude, but of great intensity. With the monochord, the amplitude by air and bone is the same, and therefore one is able to test these high tones by bone conduction.

DR. GORDON BEERY: I will not attempt to add anything of a scientific nature as a contribution to this discussion, but it does seem fitting, perhaps, that I mention one other phase. There are two national organizations peculiarly interested in the work that has been presented today. One is the Association to Promote the Teaching of Speech to the Deaf, and the other is the American Federation of Organizations for the Hard of Hearing. Both have headquarters in Washington.

DR. GOLDSTEIN: Dr. Shambaugh's summary recalls to my attention a subclassification of congenital deafness which I attempted several years ago. I divided congenital deafness into two groups: (1) biologic congenital deafness in which there was an absence of a part of the auditory mechanism of perception; (2) pathologic congenital deafness in which there was a pathologic change in the end-organ of hearing. Reference to this particular question has not been made in the report. Hereditary syphilis, rickets and intra-uterine hemorrhage play a rôle in this differentiation of congenital deafness.

Tuning forks, as instruments of differentiation in bone conduction, are not always reliable when applied to the functional examination of the ear in young children. It has been a frequent question in my mind, when making a bone conduction test on a child under 12 years of age, whether the child so tested hears the tuning fork or feels it.

Speech defects have been referred to as a feature of the committee's report. In gathering vital statistics of this character, one should ascertain whether the speech defect was observed in cases of acquired deafness after speech had been developed in the child, or whether the child tested was congenitally deaf and had never had an opportunity of hearing speech.

DR. RICHARDSON: I have little to add to the discussion. Of course this superficial running over these cases by Dr. Shambaugh today is only sketchy. One has to read them and to study them to get the significance of this work. Dr. Goldstein, for instance, has asked with regard to syphilis. In one whole institution, the Jacksonville Institute of Illinois, every inmate was tested, and I believe that there were only four that gave evidence of syphilis. Is that correct?

DR. SHAMBAUGH: Yes.

DR. RICHARDSON: So you see that syphilis plays little part in these cases and in congenital deafness. I wish we had had time to have gone over that most interesting feature of consanguinity and heredity in these cases. This has been most thoroughly worked out, but it was too extensive and too minute even to be spoken of here. It is a study which is of great significance; it was one that I was anxious to have developed, and they worked it out well.

DR. SHAMBAUGH: The chairman has called attention to the interesting problem in connection with congenital deafness: whether the condition was produced by a congenital anomaly or by some actual disease. We went into this question only in connection with syphilis and in but one school, for the results did not encourage us to pursue the subject further.

In connection with congenital deafness, presumably the result of a congenital anomaly, our assumption is that in those cases in which either the vestibular or cochlear portions are defective separately, that the cochlea is much more likely to be affected for the reason that this is the more recently developed portion, the vestibular mechanism being much older and therefore more stable.

Opportunity does not present itself for collecting statistics in connection with defective vestibular mechanisms where the cochlea is not also involved. I know of but one opportunity that presented itself for such a survey. This was in connection with the extensive examinations of recruits for aviation service during the war. In some persons the vestibular mechanism was found much below normal and even without a response when the hearing was normal. It would be interesting for some one to look over these records, if they are available, in an effort to answer the question whether the vestibular mechanism is frequently involved without the cochlea being affected.

The question of bone conduction is, of course, a big problem. One without a background of clinical experience will find difficulty in differentiating between sound perception and the tactile sensation. The men who carried out these examinations had a sufficient background to be able to evaluate their observations.

In making our tests we followed the teaching of Bezold and used the A unclamped fork for testing bone conduction. We also used the middle C 256, double vibration, but did not use the monochord. For the lower tone limit we used the C-1, 32 double vibration, C, 64 double vibration. We also used the C-4 fork, 20,048 vibrations, and the 2 A Western Electric Audiometer.

Some one asked about the value of the audiometer tests. The proof of the value would be whether these tests throw any light on such problems as preservation of speech in connection with remnants of hearing, or what remnants of hearing in the tone scale were of practical assistance to the instructor in attempting to teach these children. We have no definite answer to these questions, but the results of our examinations are presented. Perhaps there are facts concealed in these figures which we have not detected.

MARKED DEAFENED AREAS IN NORMAL EARS. DR. EDMUND PRINCE FOWLER.

When one notes the various forms of normal and abnormal ears, graphically depicted by audiometer readings, many peculiarities have recurred so often that it seems that they must have some definite significance. One striking phenomenon observed in a large number of graphs of hearing is the marked dip in the curve between 1,000 and 5,000 cycles (most often about 3,000 to 4,000). This occurs frequently in both normal and abnormal ears, and its significance is unknown. That it is not due to some peculiarity of the telephone receiver is shown by hundreds of cases which have been checked up with calibrated forks and little if any discrepancies found. Furthermore, the bone conduction measured at the same time as the air conduction also coincides with the latter, thus eliminating any errors due to the presence of unseen obstructive lesions.

With half and third octave intervals of the 1 A audiometer used for the past six years, none of the variations from the normal would have been missed, and more than a thousand graphs have been studied with this idea in mind. No defect

of hearing was complained of, and the hearing was charted merely as a routine measure to determine its normality as to the date of test. Unless one does this in many cases it will always be uncertain as to how and why certain troubles in hearing begin.

In the case reported the left ear was a high normal and the right ear was also average normal, except between the critical frequencies. Bone conduction was almost identical from both mastoids, but when a masking noise was applied to the left ear, it dropped exactly 30 sensation units to a point only 5 sensation units less than the air conduction curve. This illustrates the necessity of using a noise apparatus when testing bone conduction.

There are four explanations of these limited deafened areas which theoretically seen logical. The curve dip is due to: (1) some limited central or cortical lesion in an area presiding over these frequencies; (2) a defect in the nerve fibers owing to the tiny section of a basilar membrane which normally detects these frequencies; (3) a defect in the terminal nerve apparatus (Corti's organ); (4) An antiresonance somewhere in the conducting mechanism. In other words, the frequencies are filtered out before they reach the end-organ and the cochlea.

This suggests a defect in Corti's organ. One might imagine that the membrana tectoria is deficient or thinned in a small section so that imperfect or little contact is obtained between it and the hair cells. On the other hand, a deficient arterial blood supply to the area, or an embolism in the terminal vessel to the part, or a blocking of the return flow, may account for the picture. The branching point of the distal and proximal branches of the cochlea artery occurs approximately at the level of the basilar membrane which corresponds to the frequency affected in these cases. Many theories are possible but at present impossible of proof. Only sectioning of the ear after examining during life will clear up the mystery if it lies in the cochlea.

Antiresonance is some resonance or filter action which eleminates its own attuned vibration from any sound passing through. In connection with the middle ear mechanism, there are several possible resonators such as air spaces of differing sizes or thickened tissues. It is noteworthy that these tone deficiencies under discussion always occur within the higher frequencies (about 4,000 double vibration), and it is possible that they could easily be caused by resonance absorption as suggested. Some reasons for this belief are: (1) the clearcut limitations of the deafened; (2) the sharp cut off from the normally heard frequencies to either side; (3) no impedance lesions visible to the eye or to the usual functional tests; (4) the changes observable when an ear with such deafened areas undergoes even a slight congestion.

In the case under discussion, one day there occurred a slight feeling of blockage tension in the ear. Otoscopy showed congestion of the attic, along the malleus and slightly behind it on the drum membrane. The audiograph showed a dip by both air and bone conduction the same as before, and the lower frequency side, instead of being precipitous, sloped away at an angle of approximately 45 per cent to 2,048 double vibrations, where it was normal. The effect on the frequencies outside of the dip was practically nil, so that there was little interference with the middle ear mechanism except to change of slope and width of the dip on its lower side. Within a few days the congestion in the attic disappeared and the graph resumed its original slope. The proportionate loss by bone conduction was not altered, and this indicates that sound by way of the cranial bones was not perceptibly influenced by the changed condition of the middle ear. Various observations suggest static friction somewhere in the conduction path, though probably not in the middle ear because it would affect several other frequencies, which is not the case. If in the cochlea, it would seem that it must be Corti's organ, because otherwise it would pull down all the lower frequencies. A number of slides illustrated this paper.

DISCUSSION

MR. WEGEL: I had the opportunity of discussing Dr. Fowler's paper with him before the meeting, and it certainly seems, as he says, difficult if not quite impos-

sible that the type of audiogram which he shows can be explained by a purely conductive or mechanical lesion. The most practical hypothesis, therefore, must be one which attributes his results to a condition of the nerve.

A few days ago I looked over an old folder of audiograms made five or six years ago and found about 25 per cent of them to be of the same type as that discussed by Dr. Fowler, except that they were from chronic rather than acute cases, both the depth and width of the depression in the acuity curve being greater.

The results of the case plotted in the figure are not of the ordinary audiogram type. The plot is, as nearly as I can make it, a diagram representing the degree of failure to function of the nerve terminals along the basilar membrane, the length of which is assumed to have the average or nominal value of 35 mm. The vertical scale which qualitatively represents the degree of dysfunction is the usual sensation unit.

Both ears of this subject are about alike and indicate a failure of the nerve terminals between the limits 2 and 12 or 14 mm., amounting perhaps to complete atrophy at least in the middle part of this range, that is, at about the 7 or 8 mm. point. This means, of course, in terms of the ordinary functional tests that the acuity of hearing is markedly depressed about 3,000 or 4,000 cycles (double vibrations). This is a case of at least fifteen to twenty years' standing and occurred during practically a quiescent rather than a progressive condition.

There are also a number of other characteristics of this particular narrow region on the basilar membrane which it would seem should be correlative. The first one of these is most easily seen from the model made by Professor Bast. The ossification of the capsule as it proceeds from centers closes last over that part of the cochlea which is situated at approximately the point mentioned, namely, about 7 or 8 mm. from the round window. As I recall Dr. Crowe's discussion last year, it appeared that otosclerosis tends to originate at a focus in the capsule near the stapes and to spread over the cupola following more or less along the line of late ossification, as shown by Professor Bast to be the point in question here. It is also this 7 mm. region at which the organ of Corti is most sensitive. This region is also at the proximal boundary of the region through which small changes in pitch and intensity are most easily detected.

Dr. Crowe mentioned that on account of the condition of the blood supply the proximal end of the cochlea should be most susceptible of attack. If the reasoning given in connection with the figure is correct, then the conclusion can be made more specific and the definite 7 mm. region pointed out as being the most vulnerable point for an attack on the nervous part of the organ.

All curves show mild undulations. These may presumably be regarded as artefacts caused by resonance or antiresonance which, as Dr. Fowler says, cannot be held responsible for the sharp dip he describes.

Conductive lesions, particularly those of the ankylosis types, would be expected to affect the low frequencies only. A stapedial ankylosis, for example, would be expected to reduce quite uniformly all sensation below perhaps 1,000 cycles and would be shown on an audiogram by a depressed horizontal trend at low frequencies. There is a possibility, therefore, that with the help of inspection of the middle ear, many audiograms can be separated into two components, one which represents nerve deterioration and the other which represents the mechanical or "conductive" defect. May we, therefore, conclude that nerve deafness of the progressive type always starts at a certain definite point of the organ of Corti, spreading both ways?

MR. C. C. BUNCH: I wish to present a few of the results that I have noted in some of the tests that have been going on. In my own left ear there is a gap commencing at around 6,000 and running to about 8,600. It is shown on the Western Electric audiogram as being a loss of about 50 sensation units. Since my right ear had at one time an acute attack of otitis media, I rather suspected that I might find some similar dip in the right ear, but nothing of the kind is there.

I have recently seen a patient with mild exophthalmic goiter occurring after lobectomy, with a loss of hearing throughout almost the entire range, about 30

sensation units. It was found that the woman's basal metabolism was low; she was put on thyroid extract, and when the basal metabolism came up to normal, the hearing also had returned to normal throughout the whole range.

Some time ago, Dr. Dean and I reported a case of loss of hearing for high tones commencing at about 1,900 double vibrations, in which recovery took place after the tonsils were removed.

A third case that I have seen recently was that of a man, aged about 76 years, who had had a marked loss of hearing in one ear, and the other ear had recently commenced to go down rapidly. In examining him, Dr. Crowe found he had a number of bad teeth in the lower jaw. The upper ones had been entirely removed. Soon after extraction of the involved teeth, hearing in the ear, which had so recently gone down, had commenced to show rather marked improvement.

Whether a condition such as that shown by Dr. Fowler can be called a normal condition or not is hard to say. In elderly people at about 70 years of age, there is an extremely marked loss of hearing in practically every one for tones of about 4,096 double vibrations. This was true also, it seemed to us, in practically every case of malignant disease. These are not cases of disease of the ear; they are cases in which routine treatment is given. We have also found a similar loss appearing in a large number of cardiac cases which we have seen, but we do not know the cause.

DR. SHAMBAUGH: This presentation of Dr. Fowler's has been interesting to me especially because of the narrow limitations of the area involved. I think his reasoning as to why the location must be in the peripheral mechanism is sound. It is the only place where I can see how it is possible to produce such a lesion. However, I am of the conviction that one must get away from the idea that there are only a few hair cells concerned in the perception of a particular tone. Our conclusion today is more in favor of the idea that there is rather an extensive area in the cochlea concerned in the perception of each tone. These areas in a large measure overlap when tones near each other in the scale are sounded. This view of a more or less extensive area involved in the perception of each tone is borne out by the areas of degeneration produced in animals by the overstimulation of a particular tone. As much as one third of the basal coil is involved.

DR. RANDALL: To discuss such a subject could not be fully done here, but I would merely like to ask if there may not be a similarity to the interference which is noted with regard to the hearing of tones in relation to the external auditory canal. We know that we have our point of deafness in the neighborhood of the tragus and that there is a reflection of sound waves from the external auditory canal that produces interference. Is it not possible that there may be transmitted from both the windows of the labyrinth sound waves, passing up toward the apex and reflected back from the cupola to give us also interference within the cochlea?

DR. PIERCE: This is a fine field for animal experimentation. It is easy to cause nerve degeneration of the cochlea apparatus at given points. If this philosophy is true, and guinea-pigs or rabbits or other lower animals could be subjected to these higher sounds of a given pitch and a given intensity for a great length of time, this lesion should result. Of course, similar work has been done by several observers, and the work, to a certain extent, corresponds to what has been presented here today.

DR. CROWE: I recently had an opportunity to make some observations that were recalled to me by this discussion. Dr. Walter E. Dandy, neurologic surgeon at the Johns Hopkins Hospital, has, during the past three or four years, removed either the entire temporal lobe, or in several cases the entire hemisphere, in an attempt to cure a deep infiltrating glioma. Six of these cases have been reported by him in the *Journal of the American Medical Association*. One man survived for three and a half years. A patient seen most recently was operated on in October, 1927, and is still living. This patient had the entire right hemisphere removed.

The point is this: In none of the patients has the acuity for hearing been affected by the removal of the right temporal lobe or the entire hemisphere. In the most recent case, Dr. Bunch, Dr. Guild and others took the A 1 Western Electric Audiometer to the patient's room as soon as possible after the operation. It was demonstrated that she could hear all the tones from 128 to 8,000 double vibrations equally well in both ears. With the right ear masked with an ordinary Bárány apparatus, she could accurately repeat words and numbers heard with the left ear. With the left ear masked, she could accurately repeat words and numbers heard with the right ear. There is absolutely no doubt that she can hear ordinary conversational tones and whispers equally well on both sides with the entire right hemisphere out. Later tests with the audiometer again demonstrated that she could hear all tones equally well on both sides.

I thought this would be of interest because it demonstrates that lesions in the right temporal lobe cannot be responsible for any auditory difficulty that may be present in either ear. The audiogram of this case will be published in an early number of the *Journal of the American Medical Association*. It is not possible to make a similar examination after extirpation of the left temporal lobe.

Abscess of the Brain of Otitic Origin. Dr. Joseph H. Bryan.

This paper reports a case of an interesting abscess of the brain following a long period of disease of the middle ear. The patient was a white man, aged 23, and the history was unimportant except for the fact that he had had what he terms "chronic inflammation" of the left ear since he was 8 years of age. He first complained of severe pain in the left ear, some fever and marked vertigo. General examination was entirely negative; but when he lay in the dorsal position, he complained of a great deal of pain in the left ear and vertigo, but no nystagmus. Examination of the head, neck and eyes (including the fundi) gave negative results. The nasal and pharyngeal mucosa was congested, and the tonsils were inflamed. The right ear was normal but the left one was draining profusely, and there was a polyp emerging from the middle ear. There was no tenderness over the mastoid. Examination of the neck showed some palpable lymph glands. The knee jerks were normal, and the extremities did not show paralysis, weakness, rigidity, spasms or Kernig sign. Mentally, the patient was somewhat sluggish and drowsy but rational. Later, vomiting occurred but was not projectile in type. He continued to be dizzy; the temperature was 103.6 F., and this was followed by severe chills of short duration. The spinal fluid showed slight increase in pressure, with 6 cells per cubic millimeter, 50 per cent polymorphonuclears, 50 per cent lymphocytes, a slight increase in globulin, and negative culture. The x-ray picture showed complete destruction of all cellular structures on the left side. During the next ten days he had a number of chills and temperature of the pyemic type. The patient was irrational at times, with some motor aphasia. The second spinal puncture five days after the first one showed the fluid moderately under pressure, 565 cells per cubic millimeter, 90 per cent polymorphonuclears and 10 per cent lymphocytes. Culture was again negative.

The neurologic examination by Dr. D. V. Stuart at this time showed mental turpitude with some motor aphasia. All deep reflexes were hyperactive in both upper and lower extremities, but were more marked on the right side. The fundi were normal in appearance, and there was no disturbance of function of any of the cranial nerves so far as could be determined. The diagnosis was that of abscess of the left temporal lobe of the brain and a diffuse meningitis. The abscess was evidently of long standing but the meningitis was of recent origin, as evidenced by the different conditions of the spinal fluid one week prior to the neurologist's examination. The patient was operated on under local anesthesia by Dr. H. H. Kerr, with exposure of the left temporal region. The dura was incised and the abscess with free pus opened and drained with tubes. This abscess was in the lower portion of the temporal lobe. The patient's condition became

worse, and he died four days after operation. Autopsy showed a deep purulent meningitis, an abscess the size of a dime and destruction of the internal and middle ear of the left side.

Two slides were shown demonstrating the abscess in the cerebrum and lateral ventricle.

DISCUSSION

DR. BABBITT: May I ask Dr. Bryan if anything was found in the lateral sinus?

DR. BRYAN: I think not.

DR. RANDALL: I always make the point, until I am afraid I am a bit of a nuisance with regard to it, that records of these cases too rarely indicate a close watching of the pulse. We are told of the pulse rate as normal in many cases showing a temperature of 103 or 104, but when there is a meningitic spread of this disease there is sometimes a disproportionately slow pulse in the sixties or lower which is almost pathognomonic evidence of increased intracranial pressure of abscess of the brain. It is only by taking the pulse rate at frequent intervals that this can be noted and thus this signal element of diagnosis utilized.

DR. BRYAN: In regard to the pulse, the lowest rate was 60, and it varied from that to the highest, at 110, in the early part of the illness. It later ranged along about 80, then 72, finally as low as 42, and was 136 at the end.

DR. RANDALL: There is a rather marked discrepancy between temperature and pulse.

DR. SMITH: Dr. Bryan's case emphasizes the old story that a chronically suppurating ear is, in the average case, a potential danger; and in certain types either an abscess of the brain or some other serious complication is apt to occur, notwithstanding the fact that a patient may, as in my own experience, have a discharging ear for a period of nearly fifty years before a complication appears. One of the early symptoms of abscess of the brain—and this happens while the mentality is more or less normal—is a changed disposition; a person of cheerful disposition, who enjoys life, suddenly becomes depressed and morose, and takes little interest in the happenings about him, or vice versa. When these symptoms occur during a chronic otorrhea, they should receive most careful consideration.

As Dr. Randall has stated, subnormal pulse, temperature and respiration are characteristic of abscess of the brain without complications, but later on, when this picture is accompanied by severe pain, and more especially if the temperature, pulse and respiration should increase above normal, one should suspect a further complication, such as meningitis.

An interesting question arises whether the patient under discussion might not have lived if he had come under Dr. Bryan's care earlier and had been relieved of the accumulation of pus before symptoms of meningitis appeared. Given a patient presenting symptoms of abscess of the brain, without localization, one is justified in searching for the collection of pus in the temporosphenoidal lobe of the same side, from the fact that the vast majority of all otitic abscesses of the brain occur in this region.

DR. SHAMBAUGH: One statement that has been made in this discussion should not be allowed to pass without a correction. The statement was to the effect that every case of chronically running ear is likely sooner or later to lead to a serious complication. I would put the matter as follows: That there are some types of chronically running ears in which the trouble may lead to serious complication. In most cases of chronically running ear such a menace does not actually exist except in connection with acute exacerbation, which is perhaps no more of a menace in these cases than in a person who does not have a running ear to begin with.

To my mind, one of the greatest advances of modern otology is the ability to separate into two groups cases of chronic suppurative otitis media. In one group the disease involved only the mucous membranes lining the cavities of the middle

ear, and in the other the process is one that is invading the bone. It is only in the latter that the menace of a possible complication actually exists.

DR. SMITH: Quite naturally I agree with all Dr. Shambaugh has said. It is true that cases of chronic otorrhea are divided into two types, one of which is usually considered surgical and the other nonsurgical, and in any event, every effort should be made for relief by nonsurgical treatment before operation is resorted to. On the other hand, the aurist must determine how long he is willing to let any type of chronic otorrhea continue without resorting to an operation for its relief, because even in what seems to be the nonsurgical type, complications do occur, and when this happens one is then operating primarily for the relief of this serious complication, since all complications of chronic otorrhea are serious. In my experience, intracranial involvements are much more frequent in the recurrent type of chronic otorrhea, even though this recurrence may happen as infrequently as several years apart.

DR. RANDALL: May I ask Dr. Smith if in his x-ray pictures he does not usually find that chronic suppuration is the forerunner of mastoid eburnation and that thus the pneumatic cellular structure is effaced. Cheatle, who is generally correct, does not believe in this pathologic solidification of the mastoid, but I am convinced that Buck was right in so teaching it.

DR. SMITH: In reply to Dr. Randall's query as to whether I had taken into consideration the sclerotic changes that nature has provided for the protection of the patient, as pointed out by x-ray examinations, I would reply that, unfortunately, these sclerotic changes are confined largely to the cortex and do not, to the same extent at least, occur in the tegmen antri, tegmen tympani, tympanic wall or the osseous structure covering the lateral sinus. Indeed, it has been definitely shown that the bone in these localities frequently becomes porous and therefore does not offer a barrier to the advance of the disease such as is offered by the cortical sclerosis, which usually prevents external symptoms of mastoiditis to appear. The direction of the inflammation, therefore, follows the line of least resistance and produces one of the intracranial complications.

DR. FOWLER: I agree with Dr. Shambaugh, and think that too much operating is done on chronically running ears. Let us think back and see how many patients with chronic or recurring running ears in our own private practices have developed abscess of the brain. I do not recall a single case in my own. As Dr. Shambaugh says, whether they have a recurring running ear or not, they are not any more apt to develop an abscess of the brain than you or I, if we had an acute condition of the ear.

DR. BURT R. SHURLY: About four weeks ago I had a case that illustrates the point that one really does not know which chronic ear is going to develop serious complications and which one is not. This man, about 30 years of age, had a chronically running ear for four years. He was brought into the hospital unconscious and with all the classic mastoid symptoms. Lumbar puncture gave clear fluid, under great pressure. He had a temperature of 105, and was delirious. I opened his mastoid and followed the train of suppuration to a perisinus abscess with very foul pus which burst under great pressure. The sinus was involved so the jugular was tied and the sinus opened up and cleaned out up to the brain. The patient recovered beautifully despite large abscesses in the shoulder and gluteal regions which like the sinus pus showed a pure colon bacillus infection.

The point I wish to make is that after all these years I am in doubt as to which chronic ear is going to do the damage and which one is not.

DR. JACK: I agree with Dr. Shambugh, but why is it that the life insurance companies are so particular to find out all they can about an applicant with otorrhea? They are very keen, and I think this is significant.

DR. SHAMBAUGH: My answer to that is that the insurance companies do not know of any method by which they will be able to pick out otologists who know enough to differentiate between the dangerous and nondangerous cases.

One should keep in mind the fact that one ought not to operate on a chronically running ear because it is a running ear. One should operate in some cases of chronically running ear because experienced otologists are able to recognize that in connection with the discharge there is evidence of a bone-invading process which brings with it the menace of some possible complication. No otologist with a sufficient background of clinical experience and accustomed to making careful examination can fail to differentiate with little difficulty and in almost all cases in a single examination between these two types of chronic running ear.

As for the question whether the nondangerous type changes into the dangerous type as time progresses, I do not see this transition taking place.

DR. JACK: I agree thoroughly with Dr. Shambaugh, but why do the insurance companies question the patient? Of course one does not operate on the patients merely because they have chronically running ears, but there certainly must be enough deaths in the experience of the insurance companies to warrant their being careful in the selection of the persons whom they insure. This is the only point I was making.

DR. SMITH: I should like to disabuse Dr. Shambaugh's mind of the impression he seems to convey that the patients operated on for the relief of a chronic otorrhea may not have been thoroughly studied and selected. The patients that are operated on in my clinic, either by myself or by my associates, have nearly always been under nonsurgical care by competent physicians, sometimes for years, and when they are referred to our clinic we make further attempts at relief without resorting to an operation unless threatening symptoms are present. The indications for operation in persons with chronic otorrhea form entirely too big a subject to discuss at this time, but the broad statement can be accepted that if the patient has a brownish-yellow, foul-smelling discharge, it is an indication of involvement of the bone and should receive surgical care if not relieved promptly by the more simple measures. If the foregoing symptoms are present, together with a cholesteatomatous mass, the importance of surgical intervention is emphasized.

DR. BRYAN: I did not intend to stir up all this controversy, but I do agree with the thought that we are not in favor of operating on a chronic running ear simply because it happens to be discharging. But a chronically running ear is a menace, and I think the insurance companies with their experience are right in excluding those persons from their lists.

DR. RANDALL: Do they accept any patient as a risk that has a weak heart?

DR. BRYAN: If they know the patient has a bad heart, I do not suppose that they do.

DR. SHAMBAUGH: Then you say that all cases are a menace.

DR. BRYAN: How are you going to tell how soon it will be a menace? How are you going to tell when there is a menace if the least little excitement may stir it up?

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Regular Monthly Meeting, March 5, 1928

GEORGE F. FISKE, M.D., *President, in the Chair*

PRESENTATION OF CASES

SQUAMOUS CELL CARCINOMA OF LARYNX. DR. JOSEPH BECK.

A man, aged 29, on whom a laryngectomy had been done, showed interesting microscopic changes of typical adenocarcinoma. The microscopic diagnosis made by Dr. Hektoen revealed squamous cell carcinoma. Several pieces of tissue had been removed by suspension laryngoscopy for study and all proved the condition

to be adenocarcinoma. The man showed a gain in weight of 20 pounds (9 Kg.) in five weeks after the operation. The wound healed rapidly. The feeding tube was allowed to remain until the esophagus closed, in two or three weeks. Dr. Beck thought the most interesting things about these cases were that the patients remain alive and that speech is resumed. It gave the patient the greatest encouragement when he heard Dr. Salinger's patient speak. There has been great progress in handling these patients. They have an esophagobuccal voice which is never perfect but which certainly is a great help to them. This man was foreman in a factory, and had to speak quite plainly, and the condition was best adapted for an artificial larynx.

SQUAMOUS CELL CARCINOMA OF LARYNX. DR. SALINGER.

A man, aged 40, in February, 1927, presented himself at the hospital with a neoplasm of the larynx, clinical indications of carcinoma, infiltration and fixation of the right half of the larynx and beginning involvement of the right side. Biopsy was performed, and the condition was reported to be a squamous cell carcinoma. A two-stage operation was attempted; the first stage consisted in skeletonizing the larynx and shutting off the mediastinum. The patient developed a terrific infection of the neck that resulted in sloughing of the tracheal sutures and loss of tissue. This lasted five weeks, and the carcinoma extended into the neck, involving some of the glands. The surgeons thought that they had nothing to lose so removed the larynx, the overlying skin in the midline, a number of attached glands and 2 inches (5 cm.) of the anterior wall of the esophagus. The condition seemed practically hopeless. The carcinoma had eroded through the laryngeal box into the tissues of the neck involving the overlying muscles, thyroid, isthmus and cervical glands. Histologic examination of the specimen confirmed the original diagnosis. The man was fed according to the MacKenty technic through a feeding tube passed through the nose. At the end of three weeks, the wounds in the neck being about closed, the feeding tube was removed and the patient was able to swallow. He had gained rapidly, reaching his normal weight. He apparently had learned to speak instinctively, producing a low guttural voice which could be heard across the room, and had no difficulty in making himself understood. Dr. Salinger thought that the voice would improve.

The important features of the case were, first, that it was extrinsic and, second, that after a bad start the surgeons went ahead with the work and obtained a good result.

REPORT OF TWO CASES. DR. AUSTIN A. HAYDEN.

The first case was presented to emphasize again the fact that a Wassermann reaction of the blood is not always infallible, and that this reaction will be negative when the test with the spinal fluid is positive. This woman, aged 36, demonstrated that fact. The x-ray examination suggested the presence of a pituitary growth or a growth in the pituitary region. She complained of tubular vision and intense headache and with the Wassermann reaction of the spinal fluid $++++$ there was the possibility that the growth was a gumma and that operative intervention would be unnecessary.

The next case was that of a boy, aged 11, with a deformed upper jaw, of which Dr. Burne O. Sippy had made some casts. This boy was brought in because of the fact that he had poor nasal respiration and could not breathe with the mouth shut. The front of his nose was well formed, the septum straight and the turbinates not obstructive. The tonsils had been taken out very cleanly. He was brought in with the idea of making a cast of the posterior choanal openings. A large amount of adenoidal growth was found there. The posterior nasal openings were found large, showing that even a mouse-toothed person with a high arched palate may have sufficiently large openings from the nose into the throat behind. Wax casts of the patient's nasopharynx were presented. The size of the posterior nasal openings was measured by the width of the mold at the level of the lower margin

of the septum. An empyema of each maxillary antrum together with the large adenoid remnant was the cause of the child's persistent breathing through the mouth. With the clearing up of these conditions, the boy breathed well through his nose. The symptoms for which he sought relief disappeared, but from Dr. Sippy's casts it was obvious that he needed some orthodontal work. The case was presented to show that close cooperation between the otolaryngologist and orthodontist is advisable.

DISCUSSION

DR. BURNE O. SIPPY: I did not have an opportunity to make a close analysis of this case, but it showed a normal development and growth in the mandible and presented a class III malocclusion, a mesial occlusion, with arrested development of the entire maxilla. There was impaction of teeth in the upper arch with lingual occlusion, the upper anterior teeth being inside the lower arch instead of overhanging the lower arch. When the two upper teeth were taken and placed with the incisal edges together, this boy at 11 years of age showed the exact arch formation of a normally developed boy of 5. I am not prepared to say to how great an extent the conditions Dr. Hayden mentioned had been the result of this. I believe that it would be possible to get bony growth there by orthodontia stimulation which would bring it up to normal development, and am quite sure that this would have some influence on the boy's other troubles.

DR. HARRY POLLOCK: Some articles by Shea of Memphis described bony development following clearing up of the maxillary sinuses. Shea showed some cases in which clearing up of the sinuses developed the whole maxilla, proving that in these cases, development will occur without further stimulation if one eradicates the infection. The boy described was a little older than Shea's patients, who were 6 and 7 years of age, but the articles showed them again at 9, 10 and 11 years. There is no question but that the orthodontist can be of great help, but after the sinuses are cleared out, the normal development which had been arrested by infection would occur.

DR. HAYDEN: This child was beyond the age at which restoration of nasal breathing and clearing up of the sinuses would straighten out the teeth. From the position in which the child's front teeth were directed, with the deciduous teeth, that might be true, but in this case I believe that the help of the orthodontist was absolutely necessary.

SCIENTIFIC PROGRAM

TOTAL PARALYSIS OF THE VOCAL CORD. By DR. J. HOLINGER.

Total paralysis of the vocal cords is always a serious proposition. Fortunately it does not happen often, but a few years ago I saw three cases of it at the same time, due to operations for goiter by different surgeons. The patients were totally out of touch with their surroundings, could not do any work and were in a desperate position in every way. The patient that I am going to discuss now has a total paralysis from another cause, i. e., an aberrant thyroid.

A short perusal of the literature showed that the report of the following observation may be apropos. In February, 1926, a well developed woman, aged about 40, came in to my office with great difficulty in breathing and loud expiratory and inspiratory stridor. Her lips were blue, the suprasternal parts and the sides of the neck protruded like balloons at each expiration and sank in deeply at each inspiration. The difficulty started several years before and gradually became worse so that she had not slept for an entire night for many months, the last six weeks sleeping only five to ten minutes at a time, sitting in a chair and resting her arms and head on the back of a second chair. She had a harsh barking cough, and her voice had the same harsh monotonous sound. The laryngoscopic examination showed the upper part of the larynx free, the vocal cords pinkish, in close apposition, actively immovable and passively closing in a valvelike manner at each inspiration and expiration. There was total paralysis of both vocal cords, of unknown cause. For treatment, only intubation or tracheotomy could be con-

sidered. With the constant forceful coughing, the tube would be coughed out every few minutes. Tracheotomy was decided on. The operation gave no information as to the etiology. The patient was kept in the hospital for several weeks for observation. X-ray examination, Wassermann tests, and other measures were taken, without result.

I did not see the patient for nearly two years, but on Dec. 23, 1927, she again called me. She had a bad cold and was coughing incessantly, and I was struck by the unquestionably myxedematous expression of her face. It was difficult to ascertain the position or size of the thyroid, as the region was flabby and soft and moved in and out with each respiration, since it was implicated in the ballooning. After two days of thyroid medication, the general condition improved and the myxedematous expression disappeared. There was never any difficulty in swallowing; an esophageal bougie no. 40 was passed easily. X-ray examination of the chest showed bronchiectasis but no tuberculous foci. Then a transverse picture of the neck was taken and the following peculiar condition was recognized: The course of the esophagus and the thyroid cartilage was plain. On a level with the cricoid there was a swelling between the trachea and the esophagus 4 cm. long, protruding for 1 cm. into the esophagus. Another similar swelling between the vertebral column and the esophagus protruded 1 cm. into the lumen of the esophagus from behind, just above the anterior one. The lumen of the esophagus had a bayonet shaped course between the two swellings.

Malignant disease could be excluded, since the swelling was soft, freely movable, changeable in size and because, as the woman said, for years she was sometimes better, at other times worse.

A few years ago, I presented before this society another patient with an aberrant thyroid, a woman who developed increasing difficulty in breathing during the last weeks of pregnancy, at the same time that an otherwise hardly noticeable goiter grew to an enormous size. A tumor from the rear left wall filled the whole cavum of the larynx, and left only the anterior right part free. Tracheotomy was performed, and two days later the woman was confined; labor was rather difficult, as she could not exert pressure. A few days later, the tracheotomy tube was removed. With the help of a galvanocautery, the tumor shrank completely and the goiter diminished in size. The woman has since had another child, without experiencing any difficulty with the throat.

FIFTH YEAR OTOLARYNGOLOGY IN THE AVERAGE GENERAL HOSPITAL. DR. AUSTIN A. HAYDEN.

In this paper, the subject of otolaryngology was used as a vehicle for the conveyance of some thoughts regarding internships that had occurred to the essayist in his experience as attending otolaryngologist and chairman of the intern committee of a 200 bed general hospital of the "closed-open" type, and not closely attached to a medical college.

The fifth, or hospital year, is the most important one of the entire medical course and deserves a constructive, comprehensive and well correlated plan of instruction and training. Otolaryngologists should endeavor to interest the intern in medical organization. The hospital clinical conferences, which the fifth year student should be required to attend, will usually furnish his first actual opportunity to participate personally in a medical meeting. Attendance at all accessible medical meetings should be encouraged. The value of medical journals and the advisability of individual subscription to certain of these at the beginning of the internship cannot be too strongly emphasized as the best means of laying the foundation for a personal medical library. Interest should be stimulated in sound medical economics.

Comprehensive instruction and adequate training in otolaryngology are obviously impossible in the short time allotted to this specialty. The work should be so presented that those who wish to specialize will be inspired to take up the specialty of their own choice by the precept and example of the attending otolaryngologists, while the others will go into general practice with the feeling that the development

of modern medicine has been so great that an individual brain cannot envisage the entirety of its scope and that a single pair of hands cannot master the endless and ever changing variety of its technical details.

The head of the department of otolaryngology must see that the hospital is provided with adequate examining, treatment and operating rooms and a complete equipment of the instruments and apparatus necessary for efficient work. He should teach the intern, by his own example, the value of early and frequent consultation with other departments, as well as with other otolaryngologists. The intern should be impressed with the fact that he is apt to receive from his fifth year only what he himself puts into it, and that willing, cheerful service rendered to patients, attending physicians and hospital attachés seldom goes unrewarded. He must be taught always to compile his case histories carefully around the outstanding otolaryngologist symptoms of which the patient complains and properly correlate them with the observations of the general physical examination. Assistance at mastoid and other major operations on the ear is all the operative work that should be permitted. Whether he shall perform myringotomies, even under proper supervision, is an open question.

In rhinologic work, the local examination should be careful and detailed, and the periodicity and seasonability of symptoms should be studied. The application of casts, splints, posterior nasal packs and other appliances should be demonstrated, and the use of suction and irrigation should be explained. The recognition of disease of the accessory nasal sinuses must be taught. The advantages of photography, plaster casts, wax molds and roentgenograms should be emphasized. The treatment and as far as possible the prevention of colds in the head in infants and adults should be set forth in detail, together with the use of the local applications that give so much relief to the sufferer from the various forms of atrophic rhinitis with their accompanying laryngopharyngitis and chronic sinusitis. That the nasal cavity and its adjoining sinuses may lodge foreign bodies and new growths and that congenital syphilis may here first betray itself should be emphasized. The operative training of the intern in rhinology should be confined to observation and assistance.

In laryngologic work, taking of the history and physical examination should be thorough and painstaking. The conformation of the jaws and teeth and the general condition of the latter should be carefully observed. The appearance of the larynx, its contents and adnexa as seen through the laryngeal mirror, and the condition of the nasopharynx should be ascertained when specially indicated, if not as a routine. Throat cultures before admission, isolation of persons with diphtheria and quarantine regulations should be explained. Intubation and emergency tracheotomy should be demonstrated, and more radical measures discussed and witnessed whenever possible.

The intern should be taught how to perform operations on the tonsils and adenoids by the attending otolaryngologist and allowed to do them under proper supervision if he shows average technical skill. If this work is not taught by the specialist the intern will learn the work, less well, from general surgeons and practitioners who do so much of it in the general hospitals.

If otolaryngology blazes a trail in the new development of medical education which other specialities can adapt to their own particular needs, it will contribute to the betterment of the profession and the welfare of the public in general.

DISCUSSION

DR. N. P. COLWELL: I am glad that Dr. Hayden referred to the ages at graduation. Years ago, when only a high school education was required for admission, the average age was higher than at present. The reason was that under the high school requirement pupils would wander around trying various callings before finally trying medicine, and some of these graduated at considerably advanced ages. The average age of 26.8 is due to the large number of men who go on and get degrees before entering medical school. The percentage of graduates who also have baccalaureate degrees has increased since 1915 until now about 65 or

70 per cent of those who enter medical schools enter with such degrees. The hospital internship situation has changed tremendously since 1912. Then, the Council on Medical Education of the American Medical Association tried to find out how many hospitals would take interns. In some of the hospitals the interns merely had the duties of an orderly, pushing carts or bandaging, but doing little that would help them in the recognition and treatment of diseases. Later, however, and particularly since the war, the number of hospitals seeking interns has so increased that many more are seeking interns than can get them and that has made it possible to increase the standard of hospital work. During the last two years, it has been possible to put through a requirement which could not have been done even a few years ago. Now the hospital to be approved for training of interns must perform autopsies on at least 10 per cent of the patients dying and the autopsies must be taken up at staff conferences. This develops in the hospitals a type of medical education which is worth something and which shows whether the diagnoses are accurate. The comparison of antemortem and postmortem observations is of value to both the interns and the members of the staff. It also establishes a voluntary check over the members of the hospital staff. At one time in the medical schools the professors of medicine apparently did not care to have their diagnoses put to the test. Some of the younger teachers, however, in cooperation with some live-wire pathologists, developed the clinicopathologic conferences and the students got the benefit.

The undergraduate schools are now providing so much better clinical experience for the students in their third and fourth years that the hospital training has to be correspondingly improved. The hospital internship now represents a rounding out process of the student's undergraduate education. It is the basis for further study leading toward a specialization. The question is still being discussed as to whether the rotating service furnishes the best training or whether a straight service is better and whether the student should not go more directly into a specialty than with the rotating service. His power of diagnosis and his ability to send a patient to the proper specialist is more apt to be developed under a rotating service. The only hospitals in which the council has been willing to recognize the straight intern service are those connected with high grade medical schools. Until the time comes when the student's ability to make diagnoses is developed during his undergraduate period, there are objections to the straight service.

So far, the council has not taken up the curriculum to be followed by the student during his internship. Because of the short time the student spends in each service, unless that time is devoted largely to methods of diagnosis and indications for operation, the best part of the student's training is lost. With the rotating internship as a basis, the means for further work toward a specialization has also advanced. Since 1922, better facilities have been developed for a real training in the specialties.

Five years ago a large special hospital in the East, which made use of interns immediately out of medical schools, was visited. One of the staff men remarked, "We have just had a meeting with the interns in the eye department this morning. They wanted more opportunity for performing operations. They said that the men on the ear service were obtaining more than those on the eye service." They were told that it could possibly be arranged. That hospital was allowing students coming directly from undergraduate schools to come there and perform operations. There was no doubt of the safety of the patients in the hospital, because of the high grade men who were superintending the work. But how about the diagnoses of their own cases when the students went into practice? In that hospital, one of the best eye pathologists in the country and a professor at Harvard Medical School gave a splendid course in the anatomy of the eye, ear, nose and throat, and the better interns in that institution were voluntarily taking these courses. The staff was asked whether all the men should not be required to take these courses. Now, all physicians who enter the hospital are required to have obtained general training as an intern and also must take the courses in anatomy and

pathology of the specialty. That hospital now affords the opportunity for an excellent training leading to specialization in diseases of the eye and ear. A similar development is happening in many hospitals throughout the country where thorough graduate work is being done. The question is, should the internship be a rotating service so as to develop thoroughly one's power of diagnosis, or should it be a straight service so as to direct the student immediately into a specialty? Just how much of each specialty should interns be taught in a general course, and how much should be left for a special course?

DR. M. T. MACEACHERN: The American College of Surgeons wants to standardize the arrangements and the surroundings that the physicians and nurses work in so that they may have the best environment possible in all parts of the United States and Canada. They have a committee, of which Dr. Beck is chairman, and are hoping to bring out some valuable principles for the hospital trustees and administrators, and once they know they will help greatly in carrying it out. From a survey of 2,582 hospitals, it was found that two things are lacking: first, proper organization of the department. In by far the greater majority of the hospitals, there may be good facilities for operating, but the patients are scattered through the institution, not always near treatment rooms, and certainly not always having the specialized nursing many require. They find that there is need to teach hospital workers that special patients should be grouped together in a proper department to facilitate proper treatment and nursing. Secondly, specialists are busy and do not give the interns individual or collective teaching and instruction. There is lack of cooperation between interns and specialists on the staff, and that must be remedied. It is not the hospital trustees but the surgeons themselves who do not like to see the segregation of the special branches of surgery. Regarding interns, Dr. Colwell has been the real mainspring for years behind this tremendous cleanup of the medical schools and the improvements in hospitals from the standpoint of medical education. There are three things that interns should be taught even if they are given this instruction only for six weeks. They should be taught to take careful histories of their patients. I did not think that in most hospitals histories of persons with diseases of the eye, ear, nose and throat are as good as they should be. So that clinical data which will help in research can be collected, all the histories should be complete. In addition to careful history taking, the interns should be taught diagnosis and the use of instruments in diagnosis. They should major in this in hospitals in the first year, particularly in this specialty. Many of these men will enter country practice and should know so thoroughly how to make a diagnosis that they will know when to call in a consultant. Further, they should know something about routine treatment. Young physicians are spurred on by a taste of surgery in their year of internship, and they begin to practice with great bravery until they have had one or two reverses. It is well to allow them to administer little other than palliative treatment during their first year. The intern's chief work should be diagnosis. In regard to specializing, my experience with five physicians who are now outstanding specialists was as follows: I advised them to go to the country to earn sufficient money to study for two years in the best intensive clinics after spending five years in general work. The men who spent most time there became general practitioners first, with experience in pathology, x-ray and anesthesia, and today are successful. If all young physicians would take two years or three or four years of training in all branches, particularly pathology and laboratory work, and then spend a year or two in some industrial camp to make sufficient money to study a specialty for two or three years, I believe that they would be successful.

DR. GEORGE E. SHAMBAUGH: I am in full accord with the views expressed by Dr. Hayden, and his conclusions regarding what one should try to do for interns in their year of general internship. The question is exactly the one which the medical school has to decide in providing training in otolaryngology for the undergraduate medical course, since the year in the hospital is only a continuation of the same work, which is that of preparing physicians for the practice of general medicine. A school providing undergraduate medical training does not aim to

make specialists of its students, and the question of what one should try to teach graduates about special fields during their year in the hospital is the same question that the medical college has endeavored to answer. A decided change in the methods of instructing undergraduate students in otolaryngology has taken place during the last twenty-five years. At Rush Medical College, for example, the old practice was to give the students their clinical instruction by means of the amphitheater clinic, where operations on the nose and throat were the pabulum provided for the students. Now they aim to teach students how to make a proper examination of the nose and throat and ear, how to recognize the normal structures, how to use the special instruments for making these examinations and something about how to make a diagnosis of the more common lesions. They may also give some attention to simpler local treatment, but the thing they do not do is to give students too much operative work. Dr. Hayden brought up the question as to whether in the year in the hospital the physicians preparing for general practice should not be taught operations on the nose. That is what the student wants to learn, and one must ask whether the hospitals are unjust to the students. My answer to this question is definite. I am interested in teaching operative work but not to persons who have not had enough background in clinical experience to recognize when operations should be done. A practitioner of general medicine should not be taught operative work in special fields. The country is flooded already with physicians who perform unnecessary operations, particularly in otolaryngologic conditions; these general practitioners have learned a smattering of technic of operative work but have never had the opportunity of acquiring any proper appreciation of when these operations should be done. Several years ago an intern in the Presbyterian Hospital came to me with the request that he be allowed to go into the Central Free Dispensary and perform three operations —an operation on the tonsils, one on the septum and a turbinectomy. When I asked him why he wished to be taught how to do these operations, his reply was, "I am expecting to enter general practice in a certain city and have been told by the doctors in this locality that it would be rather slow work for the first ten or fifteen years and that I would have to expect to make a living doing tinkering operations on the nose and throat before I got a practice as an internist built up." I had a similar experience with a young man who had served as an intern under me in the Presbyterian Hospital a number of years ago. That intern came to me one day and told me he had been having some interesting work on the side, and related that he had made an arrangement with a physician who was taking care of some dispensary work by which he had been able to operate on whatever patients were brought into the dispensary. I asked him what he had done and was told that he had performed nineteen tonsillectomies, nineteen adenectomies, nineteen uvulectomies and nineteen turbinectomies. When asked why he was partial to nineteen, his reply was that these were all the patients he had been able to find. He had done these operations on each one of these patients. When asked what reason he had for taking out the turbinal bodies, he was somewhat confused, and his reply was something as follows: "Some of these patients had headache, some had ear trouble, others had catarrh." I told him that he had not mentioned any proper indication for a turbinectomy, and that the needless removal of the turbinal bodies had brought on each one of these patients a condition which would continue to be an annoyance throughout the remainder of their lives. I am convinced that one should not try to teach general practitioners the technic of operative work in a special field. This work should be reserved for those who are able to build up the background in clinical experience sufficient for evaluating the proper indications for operative work. It is a relatively simple matter to teach any one the technic of operative work. It is difficult and painstaking to teach men when to do these operations.

DR. GEORGE F. FISKE: For fifty-one years I have heard discussions along this line, going back to the time when Bellevue Hospital had two years of training; now they have five years. How is it possible to be protected from the man

who is not a specialist? After four or five years in medical school, I think that one must go and work with some man who is a specialist for two or three years more.

DR. JOSEPH BECK: Up to this time, probably forty-nine men and women have gone out and practiced otolaryngology from under my direction, and not a single one has ever been told that he could operate even when he was through with his special course; nothing was promised him about becoming an operator. It had been my fortune to see these young men and women placed with some of my friends, and they have turned out to be good physicians. So I had a definite feeling that Dr. Fiske was right, if one was interested in having good safe specialists. In my time, there were not the many opportunities offered at the present to learn a specialty. This is a large country, and there are men in practice in districts in which specialists are few. It seemed to me that in teaching men as interns one should try to teach them emergency treatment and emergency operations, and that is about all. When the emergency operation is done, the patient may be sent elsewhere for better care. The fundamental necessities in the education of a specialist are not when he begins to learn his specialty but his undergraduate work, and if schools will devote more time to pathology and anatomy when the student comes up for internship and subsequently for study, he will have a better knowledge. There is really no time for the undergraduate to get better education in the fundamentals of a specialty. In the hospitals, standardized hospitals particularly, what is required is outdoor departments. That is where the men learn, where they can be taught, and I believe that it is the best thing for interns as well as for educating specialists.

DR. A. H. ANDREWS: I was interested in hearing Dr. Beck say that he had been instrumental in making forty-nine specialists, but I can take credit for keeping a greater number of men out of the specialty. I have taught them what I could and sent them back to general practice with a better understanding of this specialty. This is what I think is needed. A specialist is not made by study. Training of the eye to see and the hand to feel and the mind to know what the eye sees and the hand feels, and judgment to know how to act under certain circumstances — only careful training will teach this, and one cannot get that in six years of medical school. I was interested in Dr. Shambaugh's report of the man who had done so many operations. I was once holding an examination in a class which I had not taught, and asked the students to give the indications for the removal of tonsils. They wrote pages and pages, but one man gave an interesting answer. He wrote out the question — "Give the indications for removal of tonsils." Then he gave the answer, "The presence of a tonsil." While interested in the subject of otolaryngology, one must remember that the obstetrician, the gynecologist, the ophthalmologist and all the other specialists are equally interested in their subject, and for each of them to carry out such a program as Dr. Hayden had indicated for otolaryngologists would require ten, fifteen or twenty years in the hospital getting ready to practice medicine. One must give them the indications, teach them to recognize cases and then let them go.

DR. HARRY L. POLLOCK: I agree with Dr. Hayden regarding the fifth year. Those who work in hospitals customarily know what interns demand. They state that they are going out to do the so-called simple operations, and in my judgment it is far better to teach them to do them properly as they have taught some general practitioners who came to their place. It is far better to teach them something than nothing at all, and while one cannot make specialists of them in six weeks, one can teach them the technic. They let them operate under supervision, because they are going to do it anyway. If one did as Dr. Andrews did, told them not to take up operating at all, that would be still better, but 90 per cent of the tonsillectomies performed are done by pediatricians and general surgeons, and it is better to teach students to do it properly than to let them mutilate the patients. If one had a large enough service, one could do a great deal toward teaching interns.

Directory of Ophthalmological and Otolaryngological Societies

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SECTION ON LARYNGOLOGY, OTOLOGY AND RHINOLOGY

Chairman: William V. Mullin, Cleveland Clinic, Cleveland.
Secretary: Dr. Gabriel Tucker, Bronchoscopic Clinic, University Hospital, Philadelphia.
Place: Portland, Ore. Time: July 8-12, 1929.

AMERICAN BRONCHOSCOPIC SOCIETY

President: Dr. C. J. Imperatori, 17 E. 38th St., New York.
Secretary-Treasurer: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia.

AMERICAN LARYNGOLOGICAL ASSOCIATION

President: Dr. Bryson Delavan, 40 E. 41st St., New York.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Hill Hastings, 1136 W. 6th St., Los Angeles.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.

AMERICAN OTOLOGICAL SOCIETY

President: Dr. J. Gordon Wilson, 104 So. Michigan Ave., Chicago.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Luther C. Peter, Physicians Bldg., Philadelphia.
Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.

LOCAL

THE COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Dr. C. Howard Darrow, Metropolitan Bldg., Denver.
Secretary: Dr. Harold L. Hickey, Imperial Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg. Time: First Saturday of each month from October to May.

SECTION ON OPHTHALMOLOGY AND OTO-LARYNGOLOGY OF THE MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA

Chairman: Dr. Walter A. Wells, The Rochambeau, Washington, D. C.
Secretary: Dr. J. N. Greear, Jr., 1740 M St., Washington, D. C.
Place: 1718 M St., N. W. Time: 8 p. m., third Friday of each month.

ATLANTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. Arthur J. Fort, Medical Arts Bldg., Atlanta, Ga.
Secretary: Dr. Leon E. Brawner, 157 Forrest Ave. N. E., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Arthur M. Corwin, 25 E. Washington St., Chicago.
Secretary: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Grill Room, Stevens Restaurant, 16 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

INDIANAPOLIS OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Thomas Hood, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

NEW ORLEANS OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. J. Raymond Hume, Maison Blanche Bldg., New Orleans.
Secretary-Treasurer: Dr. W. A. Wagner, Pere Marquette Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital, New Orleans.
Time: 8 p. m., third Thursday of each month from September to June.

SECTION ON OTOLOGY AND LARYNGOLOGY OF THE BALTIMORE CITY MEDICAL SOCIETY

Chairman: Dr. Edwin N. Broyles, 1100 N. Charles St., Baltimore.
Secretary: Dr. Waitman F. Zinn, Medical Arts Bldg., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

DETROIT OTO-LARYNGOLOGICAL SOCIETY

President: Dr. William Fowler, 1048 Maccabees Bldg., Detroit.
Secretary-Treasurer: Dr. Don A. Cohoe, 13535 Woodward Ave., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

THE KANSAS CITY EYE, EAR, NOSE AND THROAT SOCIETY

President: T. S. Blakesley, Lathrop Bldg., Kansas City, Mo.
Secretary: Dr. A. E. Eubank, 636 Argyle Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May; the November, January and March meetings are devoted to clinical work.

NEW ENGLAND OTOLOGICAL AND LARYNGOLOGICAL SOCIETY

President: Dr. Gordon Berry, 19 Elm St., Worcester, Mass.
Secretary-Treasurer: Dr. Calvin B. Faunce, 320 Commonwealth Ave., Boston.

ACADEMY OF MEDICINE OF NORTHERN NEW JERSEY SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Henry C. Barkhorn, 45 Johnson Ave., Newark, N. J.
Secretary: Dr. Lee W. Hughes, 1019 Broad St., Newark, N. J.
Place: 91 Lincoln Park, South. Time: 8:45 p. m., second Monday of each month.

THE SECTION OF LARYNGOLOGY AND RHINOLOGY OF THE NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. David H. Jones, 114 E. 54th St., New York.
Secretary: Dr. Edward Frankel, Jr., 152 W. 58th St., New York.
Place: 103d St. and Fifth Ave.
Time: 8:30 p. m., fourth Wednesday of each month from October to May.

THE OTOLOGICAL SECTION OF THE NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. J. L. Maybaum, 12 E. 86th St., New York.
Secretary: Dr. R. T. Atkins, 4 W. 53d St., New York.
Place: 103d St. and Fifth Ave. Time: Second Friday of each month from October to May.

EASTERN NEW YORK EYE, EAR, NOSE AND THROAT ASSOCIATION

President: Dr. J. Ivimey Dowling, 116 Washington Ave., Albany, N. Y.
Secretary-Treasurer: Dr. L. Prescott Brown, 33 Bancker St., Albany, N. Y.

CINCINNATI OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Walter Murphy, 707 Race St., Cincinnati.
President-Elect: Dr. Charles C. Jones, 19 Garfield Pl., Cincinnati.
Secretary-Treasurer: Dr. Harris H. Vail, 24 E. 8th St., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

THE OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SECTION OF THE CLEVELAND ACADEMY OF MEDICINE

Chairman: Dr. W. J. Abbott, 8314 Euclid Ave., Cleveland.
Secretary: Dr. A. L. Stotter, 1148 Euclid Ave., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

President: Dr. W. J. Mellinger, Santa Barbara, Calif.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.
Place: Santa Barbara, Calif. Time: April 18-20, 1928.

PHILADELPHIA LARYNGOLOGICAL SOCIETY

President: Dr. Ralph Butler, 2007 Chestnut St., Philadelphia.
Secretary: Dr. Herman B. Cohen, 13th & Spruce Sts., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

THE SECTION ON OTOLOGY AND LARYNGOLOGY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

Chairman: Dr. James A. Babbit, 1912 Spruce St., Philadelphia.
Clerk: Dr. Curtis C. Eves, 1910 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

THE MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

Chairman: Each member, in alphabetical order.
Secretary: Dr. M. B. Selingstein, 801 Union and Planters Bank Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

DALLAS ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. John G. McLaurin, Medical Arts Bldg., Dallas.
Secretary: Dr. W. Mood Knowles, Medical Arts Bldg., Dallas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

FORT WORTH EYE, EAR, NOSE AND THROAT SOCIETY

President: Dr. H. L. Warwick, Medical Arts Bldg., Fort Worth.
Secretary: Dr. A. E. Jackson, Medical Arts Bldg., Fort Worth.
Place: University Club. Time: 6 p. m., first Friday of each month except August.

EYE, EAR NOSE AND THROAT SECTION OF THE HOUSTON ACADEMY OF MEDICINE

President: Dr. Ray K. Daily, Medical Arts Bldg., Houston, Texas.
Secretary: Dr. L. W. Raney, Post-Dispatch Bldg., Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of the mouth from September to June.

THE MILWAUKEE OTO-OPHTHALMIC SOCIETY

President: Dr. Charles J. Coffey, 221 Grand Ave., Milwaukee.
Secretary-Treasurer: Dr. Edward R. Ryan, 425 E. Water St., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

Book Reviews

NOSE, THROAT AND EAR. By JOHN F. BARNHILL, M.D. Pp. 604, with illustrations. New York: D. Appleton & Company, 1928.

This volume was prepared "chiefly for students and practitioners of medicine" and as such aims to leave out much of the detail and clinical discussions concerning the problems in the field of otolaryngology that confront the practitioner who is specializing in this particular field. Accompanying the text are 452 illustrations most of which are new or present new adaptations of well-known illustrations. The text bears the characteristic stamp of having been written by a man who has reached working conclusions regarding the clinical problems in otolaryngology. The arrangement of the chapters and the material presented are original. The presentation of the technic of operative work is particularly lucid, and this will be read with interest by those who are specializing in this field.

As a book intended for medical students and general practitioners it would seem to the reviewer that more emphasis is placed on the technic of operative work than is justifiable and that not enough is presented regarding the indications for various operative procedures. Medical students and general practitioners do not have any legitimate interest in the technic of surgical work, particularly in the special fields, but they should have an interest in the pathology and symptomatology of the diseases of every part of the body. Everything in the text is presented with directness and clearness, which will leave no confusion in the minds of the readers as to the views of the author.